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No. 1

A NEGLECTED FIELD IN EDUCATION.

BY C. R. NARAYANA RAO, M.A.

EDUCATIONAL inspection is perhaps the one subject which has not received any great measure of attention from the educational writers and critics. This comparative neglect is due partly to its technique not being understood and partly to its importance not being recognised. At any rate in India, the inspecting agency is a long way behind the times, for none of the changes which have been recently introduced into the theory and practice of teaching have produced a corresponding reaction in the other department. No sensible man holds the view that a single teacher, whatever his attainments, can successfully teach more than two out of the nine or ten subjects embraced in a high school curriculum; but the Inspector of schools, who is only drafted from the tutorial line, is expected to review satisfactorily both the work of teachers and the achievements of pupils.

The school inspector is rightly looked upon in the scheme of things somewhat in the nature of a supreme pedagogical dictator and the primary objects of school inspection include the discovering of the multifarious needs of the different institutions comprised within his jurisdiction, a close examination of the facts of school life with a view to estimate their worth, systematisation of

such facts derived from the several schools so as to arrive at a basis for guiding their progress and finally as a result of a comparative study of the school statistics to develop certain standards for controlling and co-ordinating the educational activities of the province. It is obvious that emphasis at least on some of these points will vary according to the conditions of the award of grants-in-aid, *i.e.*, the policy of Government in the matter of award, will be determined either by the requirements of the school in order to bring it up to a certain standard or by the educational merits of the school at the time of inspection, or by any other special feature for which the school may be distinguished. In a sense this class of work is at once the cause and effect of the educational policy of the Government. A hide-bound programme of this description leaves hardly any time for the consideration of the individual possibilities of schools or the broader aspects of their life. What is regarded as the formal or mechanical part of inspection will bear a new interpretation altogether if it were viewed in the light of what pupils did outside the school, their games, pastimes and home work, their physical conditions, their general reading, the unity of curriculum or its suitability to local circumstances and the relation of school to social and industrial opportunities. In the next stage, if there is sufficient zeal and insight, interest ought to be developed by the inspector in problems relating to the comparative economy of the different educational processes based on the various

hypotheses derived from the theories of psychology.

Nothing is easier than to class these sentiments under the category of counsels of perfection and perhaps they will remain so till a merciful Providence gives us more courage in thinking and acting. One might ask why there should be so much agitation in the educational world in England at present, while there is comparatively less talk not only in the enemy country but in France and America. With all her liberal instincts, England has been most conservative in her educational institutions, "which stand for an attempt at moral unity based partly on individual experience, partly on inherited traditions of various social groups and partly on administrative organization." Obviously, the British view of education is the most complex and in India we have only an inferior edition of this view, which is as difficult to define as it is liable to ineffective compromise. In British India the governance of education is not after the American model and the Fendatory states select generally their immediate neighbours for their educational models.

It is somewhat unfortunate that our educational ambition should be so circumscribed that we continue to derive comfort in mistaking the establishment of more schools and perpetuating a mouldered type of instruction in them, for "progress in education." Educational progress involves the addition, by conquest of fresh facts as a result of investigation, to the stock of knowledge on education and is not to be confused with the extension of primary instruction. Growth by accretion is certainly different from growth by development. The latter is characteristic of the Organic world, while the former, of the mineral kingdom. In its evolutionary history Indian education is still in the throes of crossing that barrier which separates empiricism from science, and it will be therefore no wonder if the conception of the duties of the inspectorate

as set forth in an earlier paragraph, should be treated as outside the range of practical politics. I shall, however, proceed to deal briefly with some of the phases of the latest methods of school inspection in general as obtaining in the continental countries.*

So long as the individual examination system prevailed, the inspector constituted himself into a school critic and the teacher actually would hoodwink him in exerting to secure good results. The whole process according to this system would reduce itself into a game of manœuvres, and the relations would be far from cordial. Chiefly under the influence of the Education Act of 1902, this method of testing the attainments of single pupils by oral questions, was replaced by one of focussing the attention on the aims and methods of the teacher. Very often this is understood to mean that the inspector is to form a judgment of the educational values of the school by listening to a few lessons given by the teachers to the different classes in their several subjects, and himself remain in a state of masterly inactivity: but the spirit of the Act of 1902 demands that the Inspector should pay greater attention to ideals. He is to stop and talk with teachers and head-masters more than listen to lessons with a view to discover their ideas about their work, any reforms introduced or contemplated; he may saunter apparently without any method, but is expected to gather information with which to estimate the influence of the school on the children; he has to teach at least some of the classes in subjects in which he is especially interested, not only by way of setting a model to the teacher but more with a view to discover the diligence and resourcefulness of the scholars which intelligent questioning reveals; he is to take special note of the way in which pupils get

* The reader is referred to Occasional Reports No. 7—Methods of School Inspection in England.—by H. G. Wyatt, for fuller information than this article affords.

ready for the written tests, their readiness in expressing themselves orally on work done, as exhibiting the method of instruction. But what he is really doing in all this varied and somewhat erratic procedure is not so much to discover the attainments of the pupils in any subject or to gather for himself material for report on the school as really to find out what those scholars are gaining from the school in a broader educational stand-point, in power, for example, to deal intelligently and keenly with the ordinary demands of their every day life.

Any change in the method of inspection must also affect the demands made on the inspectorate. The Education Act of 1902 made it imperative on the Educational Board to look in the inspector for a far deeper knowledge of educational aims and methods and greater ability to consider the value of each school in relation to its environment; and "while he was free to take any initiative or conduct experiment, he was expected to secure that personal co-ordination in principle and practice amongst his colleagues, if the unity of the different grades of instruction is to be maintained or economy of effort secured in the realisation of ideals." That special training is required for the proper performance of these complex functions is undisputed. The argument that one need not be a practical teacher to appraise a school is only on a par with that other theory that any mind is good to deal with educational problems. If by appraisal we mean the formation of an opinion on the school as a place of instruction, then there is force in the proposition that the more ignorant one is about the school the more near to the truth will be one's judgment; but in practice appraisal involves an estimate of the endeavours of the school to attain to perfection. To have lived the teaching life is the surest way of arriving at a correct understanding. Unless the Inspector possesses sufficient driving power, which is another name for personality and

training, he becomes a confirmed anachronism in the new system of inspection. The profoundest difference between teaching and other professions is that the material dealt with in the former and machinery employed are less "material and less mechanical" and the whole object of the educational endeavours is the making of humanity.

In the very nature of the circumstances the inspector is the last person to watch the school in its normal working condition, for his presence introduces a new atmosphere besides producing a great deal of excitement. The question is whether he can avoid disturbance, if not, what kind of disturbance will best serve his purpose. If it is observational inspection, the clever teacher will give a show lesson on some favourite subject, and, if examination inspection, the dodge will be to cram the pupils on anticipated questions. Either way the purpose of inspection is defeated. The element of disturbance is reduced to a minimum when the inspector proceeds to tackle ideas and ideals instead of either the pupils or the teacher and the disturbance becomes emulation when the teacher and inspector understand that they are "equally concerned to co-operate in furthering a common cause;—to awaken intelligence and train ability in the scholars." The recognition of this principle was the cause in 1905, of the cessation of instruction regarding the procedure and inspectors possessing the power of initiative welcomed the freedom. The work apportioned to the deputies, the actual class room procedure, the method which the inspecting officer adopts for measuring the instruction in each case, must necessarily vary with the individual but in no case should the officer go straight to test the pupils' attainments or the teachers' methods. The investigating of both, however useful they may be for an estimation of the school's work,—especially of the intelligence that is shown in combining the development of a common school spirit and policy with freedom of action in the

individual teacher and in choice, and adaptation to circumstances or curricula, syllabuses and lesson,—will have to be handled very tactfully. The first step is therefore “to adopt an attitude of learner,—the inspector wishing to find out what the teaching is all about, though, of course, an intelligent teacher will be anxious to avail himself of the wider experience of the inspector, in suggesting further improvements, or fresh ideas.” The inquiry into method and aims of lesson will therefore take the form of a discussion in which the inspector will divest himself of all critical spirit. If any portion of the work of the teacher is to be criticised at all, then criticism ought to take the form of suggestion or description of some plan or device found successful elsewhere and in which the teacher would naturally be interested.

The written work given at inspection of this character should be assessed, partly by the teacher whose working will indicate the standard expected of the class, and the bulk of work will have to be carried home where time admits the analysis of papers for ascertaining the prevalent merits and defects.

The record of class lessons or what is called “Rough Notes” is like a torch; the more you shake it the more light it sheds on school activities. A careful inspection of these books will enable the inspector to apply a common measure to the pupils’ attainments, to find out how far the teacher has secured the attention of his class, the individual merits in special subjects, how far the pupil has been led to think out for himself, any special methods introduced by the teacher, his standard of teaching and several other useful items of information. In fact an examination of these books will cause no disturbance and is resorted to by the inspectors as a better form of meeting their ends. An annual detailed inspection of the principles, methods and organization of the school life is out of place and in fact even the ordinary visits of the officers need not be repeated every year provided the

authorities are satisfied that there will be no dereliction of duty on the part of the teacher. The general organization of the school, the system of classification, of distribution of work amongst the staff, the arrangement of time-table and of syllabuses of studies, the machinery of discipline, the influence of the school and the special aptitudes of the staff would be items of discussion with the Headmaster.

Though it ought to be possible to obtain a just idea of the school in all its varied aspects within the time given, to attempt to write off a report straight after the first visit is ridiculous. The first inspection can only open out lines of enquiry and in nine cases out of ten “the inspector may come away doubtful as regards any point of excellence or defects either in the methods of teaching or organization.” If the official estimate of a school ought to be a reliable record, the officer should repeat his visits before making up his mind. He first prepares the way for the second and the opinions formed in the first visit will regulate the procedure of the second, besides enabling him to get a deeper insight into the secrets of success or failure of the particular institution. Apart from securing greater justice of estimate, the repetition of inspection such as outlined above and the comparing of notes by two or more officers about the results of inspections of the same school will secure continuity which is so essential to progress. Continuity of inspection means continuity of spirit in the school’s work; the deputy follows up the work of the chief and progress is bound to proceed on a given line. The advocacy of strict continuity does not mean the extinction of the individuality of the school, but is only a device for its promotion along any bent the school may have discovered. The inspector if he knows his job will suspect the work of his subordinate staff aiming at an even level of excellence of all the schools. For that is the surest indication of either slackness or

dulness. Just as the whole purpose of education is to foster and encourage the original differences among children, a carefully planned inspection will seek for special characteristics of the school, and deepen such differentiating qualities.

Staff meetings, conferences of inspectors and invitations to the Head-masters and leading citizens to meet and discuss the local educational wants with the inspecting agency are useful *only* when there is a *purpose* behind them. There is absolutely no point in calling a staff meeting for discussing any comment relating, say to a particular class, or subject or teacher, but essential when the policy of the school has to be altered, or any new method of instruction is planned, or any subject that affects or concerns the school as a whole. It will certainly do us good if we have some correct notions about when and how to conduct at least educational conferences among the inspectors,—say in charge of the Anglo-Vernacular and Village elementary schools. The chief inspector in charge of the district carefully divides his jurisdiction into several smaller areas each typifying certain local characteristics in reference to the pursuits of the people. Each area will be under the observation of two or more subordinate officers at once on the lines and principles laid down by the chief for a period of three months. The district inspector visits each area himself maintaining his own notes and even may hold informal meetings at which the notes of the subordinates may be discussed. The batches of these assistant inspecting staff will then exchange their areas particularly with a view to get the groups of schools examined by different sets of officers. At the end of the year or two years when particularly the subordinate staff will have gone over the entire district, a conference is called at the head-quarters at which the head-masters and principal citizens directly or indirectly connected with the schools may be invited to attend. The

deliberations will take the form of a discussion of notes on the several areas maintained by the different sets of officers whose viewpoints about any particular group of schools must necessarily vary. The head-masters and the representatives of the governing body may supplement the discussion as points arise which may need deliberate treatment. Opinions and impressions instead of being delivered *ex cathedra* will be given with an absolute sense of responsibility based on varied experience and can be supported by facts of observation. The chief inspector who will preside at these conferences will in summarising the deliberations point out where his own observations agree with or differ from those of his assistants, lay down the principles and plan of the educational campaign to be opened and carried out in his district for the next three years. In posting his subordinates to any particular area to carry out the new policy, the district officer will pay attention to the special aptitudes which his subordinates may have displayed in examining that portion of the district. The head-masters know what is expected of their staff and the governing authorities know what will happen in their schools in the next three years.

Seeking advice should not be *infra dig*. There are few inspectors, I should think, who are without some special subject or aspect of work in which they are proficient, though all round excellence is a myth. For example, if any inspector is not satisfied with the science teaching in any large school in his jurisdiction, he may seek the advice of his scientific neighbour; or if school gardens or special courses in rural subjects have been lately started in his district, he may ask some more proficient colleague to see one or two schools with him and assist him with advice. We have not come to the point in the advance of education in our State, at which it would need the appointment of specialist inspectors. It would be an excellent arrangement if we could get the

district inspectors to see one another's work.

All local efforts get quickened by fresh ideas poured from outside, if they are not in the habit of originating spontaneously. One of the means of acquainting the inspecting staff with what is going on elsewhere is through the publication by the divisional inspectors of summaries of the inspectional reports of countries after which our own educational models are fashioned. It may even be necessary to depute occasionally one or more of the promising young inspectors to foreign countries to make special study of the methods of inspection and systems of education.

Other subjects like the relation between the elementary and secondary grades of inspection, reports and minutes, educational and medical inspection, administrative duties, and the inspection of secondary schools, which are the functions of the specialist inspectors must stand over for the present.

In India education has not reached any stage of specialisation and consequently the inspection is not divided into branches like technical, medical and so forth all separately staffed. However, two grades of the general branch are distinguished, the elementary and the secondary. The question therefore of the opportunities and arrangements for co-operating between officers in these branches is well worth consideration, for an ideal educational system ought to preserve continuity of policy in the different grades of instruction. At present the relation between the divisional and district officers and their subordinates is purely official and not educational and meetings in which they discuss common problems are few and incidental. The attention of each officer is naturally centered upon his own grade of school, and in the nature of things, it may not be quite possible, for example, the divisional inspector to visit elementary schools, though as a point of principle he should. The problem

is partly one of time; and indeed some of the conferences that do take place among the officers of the secondary and elementary grades do not go far enough, chiefly because they have not had any common subject under investigation in their respective jurisdictions and therefore the deliberations become general and diffuse. The co-ordination of syllabuses in an elementary and secondary school; the age at which the foreign language is to begin; the reconciliation of the difference in method and subjects of teaching in the vernacular schools for the sake of prospective secondary scholars and those that would drop; the amount and kind of out-of-school work; the arrangement of examination courses; the provision of buildings, equipment and training of staff are among the category of subjects that will provide common interest. In our State the divisional inspectors are now in charge of the normal institutions. The elementary school inspectors would profit immensely if, in any particular area, they are brought into closer and regular association with the inspection of the training institutions which prepare teachers for the schools under their control. If a scheme could be devised by which a certain proportion of the elementary inspectors would be enabled to revise their own training whenever they are thus associated, their work of inspection of the training institutions will be confined to visiting the practising section or watching a model lesson in progress and otherwise familiarise themselves with any improved method of instruction that these schools may have introduced or which they may reasonably expect to be carried out in the schools in their charge. Thus whereas the divisional inspector will have the opportunity of going into the details of the life of such institutions, his subordinate staff will by their association not only help him as official examiners of written work, but chiefly watch the essentials of training. A scheme such as this is wanting at present.

It is too premature at present to talk of specialist inspector and the relation of the medical inspectional staff and educational officers.

The inspector, whatever his grade may be, is looked upon as an apostle of progress in education in its true sense and is primarily "answerable to the wider public for his stewardship." The pressure of administrative and multifarious other work hardly leaves him time to enter upon duties other than those of the inspector as such. But there are not wanting men in the inspectorate who hold that the influencing or educating of public opinion is something "more than a work of supererogation on their part." In common with the head-masters they ought to look out for opportunities of familiarising the public mind with the ideals and position of schools at the present day and with its own obligations and responsibilities towards them. If the parents do not or would not come to the schools, it is far easier to take these schools to the parents and the whole thing depends on the degree of confidence that the head-master and the inspecting agency enjoy and the influence they can exercise among the people amidst whom they work.

It is commonly held that the writing of reports is a dreary task and is certainly so when they are, as annually, written for their own sake. Since the reforms of 1905, the substitution of "inspection" for "examination" and of visits without notice instead of the annual visitations and the award of grants not being dependent on the yearly estimates of the schools' "progress", there has been no administrative necessity of "succeeding a visit with a report, except a comprehensive, triennial report" after the conference such as was sketched in the beginning of this article. Unless the inspection is a detailed one, the report has to be very brief and avoid all attempts to cover each of the recognised number of topics pertaining to a comprehensive estimate of the worth of the school in all its main bran-

ches. Usually two classes of reports are contemplated by the inspectors of the English schools; firstly the report which conveys at more or less length a summary impression of the condition of the schools as a whole, particularising where it is considered worth while some special feature in the schools life,—a class or subject, anew plan of teaching or apparatus, the premises or organization. Secondly, a report confined to a specific point for a specific purpose, for example, the provision for the teaching of a new subject since the last inspection, the addition of a new laboratory or innovation in the curriculum. The prevailing defect of most reports is that they are full of destructive criticism; this is as much to be deprecated as writing doctrinaire views. No one knows more intimately the social difficulties and circumstances attending a school than the head-master and that inspector must be a very bold and confident person if after a single visit or at most two in the year, proceeds to criticise outright or is profuse in suggestions for improvement. On the other hand, as a trained observer of the problems and practices that obtain in a variety of schools, the inspector would be wanting in capacity if he did not collect ideas, principles or expedients likely to be applicable in different sets of circumstances. Once the inspector is in possession of facts based on personal investigation, he cannot resist the temptation of analysing them. Analysis of facts is the basis of science. Take for example that much abused word "Progress." A school has not progressed if the attendance in the different classes becomes larger or there are more passes in a particular year. I should regard that school to have "progressed" if it has succeeded in producing the same measure of intelligence in the pupils of a certain class in any particular subject, say by devoting now two hours in a week, that it used to produce formerly by setting apart three or even four hours. It should be borne in mind that higher results can never be obtained by pressure. That extra hour or two may be rationally devoted for instruction in incidental subjects. This is progress and not overburdening the syllabus irrationally, which would certainly be the case if we went on adding new subjects just with a desire to be thought of well by our neighbours. The difference between the two processes is the difference between science and empiricism. A question like

the relation between the time devoted to a subject and the results obtained can be treated scientifically only by the inspector who has facts in his possession. These facts are the by-products of reports and statements.

Unless the inspector is a living scientist or has the scientific habit of mind, he is simply a child in the matter of appraising the work in different subjects of the high school. A full-dress inspection of the High School is generally the rule, and the assistants who help the divisional inspector must have had professional training and must have specialised at least in one or two subjects of the High School studies. When an inspector and say three of his assistants settle upon a school, the only way in which each of these officers with special subjects or lines of enquiry can avoid intermittent vacant intervals is to give up the day's time-table and allow the officers to take the class in their own subjects. With a little pre-arrangement the whole work should proceed without the slightest disturbance. The actual class room procedure in inspection differs somewhat from that of the inspector in elementary schools. In the latter case the tendency is to give greater attention to watching the lessons more with a view to discover the teacher's resource or adaptability whereas in the High Schools, the purpose is to push enquiry deeper into the comparative methods, hypotheses and principle. Printed schedules of enquiry with headings and sub-headings are useful within certain limits in the case of the higher institutions and are out of place in an elementary school, for it is of infinitely greater importance that a searching investigation is made into every aspect of the High School's activity, its organization, premises, equipment, time-table, curriculum, training and special aptitudes of staff, and so forth. It is almost fatal to the science of inspection if the questionnaire is of the fixed type; indeed some very excellent things become wooden the moment they are officialised. The printed schedule ought to be more a help to the memory for anything that distinguished one school from another will strike even the most casual observer and the greater part of the report must hinge on this distinctive character. Occasionally it may be of advantage to have the school in certain branches inspected by specialists assisted by the regular officers.

NOTE ON INDUSTRIAL EDUCATION IN UNITED PROVINCES.

By M. V. KIBE,

Excise Minister, Indore.

IN August and September last I made a tour in the U. P. to visit industrial institutions and concerns. Of all the Provincial British Indian Governments, the U. P. Government seems to have been anxious to impart industrial instruction to classes which have been accustomed to it. Bombay was perhaps the first in the field to establish institutions for giving technical education. The initiative was taken by its successful business men. Commensurate with their wealth, they created magnificent buildings and lavishly equipped institutions. The latter took their Western prototypes for their model and resulted in being something above the heads of the people and the times.

It is only in recent years that the British Indian Governments have awakened to the needs of India and the strenuous times of the War have led them to see the folly of neglecting the industries of the country. The defects in the attempts already made have to a large extent been discovered and attempts have been already begun to rectify them. They are yet few but in course of time they bid fair to be adequate.

The department of Industries in the United Provinces has so far started six institutions for teaching various kinds of industries and giving technical knowledge in mechanical subjects. In locating them cognisance has been taken of the fact that an institution teaching a subject has been established in a locality where the indigenous artisan class is devoted to that branch of industry. The Industrial Exhibition held at Allahabad in 1910 discovered the

numerous indigenous industries scattered over the Province, together with their extent and strength, and since then the policy of establishing the institutions referred to has been initiated.

There have been lately started at Cawnpore two institutions of the kind. It being the centre of Cotton Mills and leather factories the institutions teach subjects which are germane to them. A school for imparting instruction in dyeing and printing has been started under the Principalship of an Indian Scientist trained in Europe. There are two classes of students. One class of them has received some training of science in English, the other one is recruited from the professional men and families. This feature is common to all the institutions started by the department. To men with English education both theoretical and practical training is given; the training of the latter class is almost entirely practical. Another common feature is that the various local authorities in the Province provide scholarships to students. Students from Native States are admitted to a small extent. All these institutions have boarding houses attached to them. The school is handicapped for want of machinery for staining Calico Printing, for which some places in the U. P. are known.

Contiguous to it is the school for leather works. Here shoe-making, box-making and making of various kinds of leather things is taught. Instruction is given in English and the Vernacular according to the capacities of the classes. The instructions they receive here will fit them for starting factories on a small scale on their own account.

Lucknow is the centre for Iron Works and artware established since the days of the Nawabs. A school for mechanical engineering is established here. There are in it at present about 150 students of all grades of education. A department of motor

mechanics is also added. The aim is not to turn out learned mechanical engineers, but practical mistresses. Arrangements are made to supplement the education received here by attaching scholars to Mills and other factories before passing them out.

The other Government institution is a school of arts and crafts. In it printing and engraving, simple, photographic and in colours, smithy—gold and silver, toys making, furniture making and such subjects are taught. Here too there are about 150 students. Located in Nawabi buildings, amidst artistic surroundings, this school creates an atmosphere not to be had every where. It is however capable of expansion.

Benares is the centre for cloth making, especially gold cloth. A school of teaching weaving by means of improved looms is located here. The school is maintained partly as a commercial concern. A drawback here appears to be that no attempt is made to teach the art of gold clothmaking.

As a means of encouraging the various other manpower industries, a store for the sale of wares has been established at Cawnpore. It is located in a building in the Bazaar and is called the Exhibition of Village Industries.

Laudable as the attempts are, they fall far short of the requirements which were revealed by the Exhibition. There are several arts, such as the hand paper making industry of Muttra, which requires investigation and encouragement. There is no doubt that it is the aim of the newly created Industries Department.

ESSENTIALS OF ECONOMIC PROGRESS.

BY THE EDITOR.

WITH this number we commence the fifth volume of our *Journal*. During the past four years, we have had the support and assistance of a large number of writers, both within and outside the State. With this aid we have been able to do as much as may be possible for a *Journal* of this kind in attracting attention to the importance of the subject of the economic development of the country. This work has been described in recent times as *the* work before us. The war has shown in many ways how far behind we are in the scale of nations in this particular matter. The work before us requires leaders of high grade type who will give their whole-hearted attention to it. Hitherto the Government service has drawn to itself the best intellect of the country. It is time that a portion of this talent is diverted into this new channel of activities. The coming years will show how much this diversion is necessary. The western world is all for re-construction on a new basis to suit the needs of to-day. We, in India, have still had no men to do the simple things that are necessary to re-adapt the old conditions in which we have found ourselves, owing to the annihilation of time and distance by the inland and ocean telegraphs, the railway and the steam ship. Shall we move with the times or be left in the march? That is the question we have to answer to-day.

The close of the war brings us to a new epoch. This epoch will be marked by tremendous competition in the Western world, which will spread into the East, of which India forms a great part. Now what is the duty of this country in regard to this matter in the coming years? The several Governments in India are anxious for in advance in the commercial and industrial

development in their own areas. They have already, in certain cases, commenced work. They are urging by advice and demonstration their people to follow suit. Now is the time for them to act.

The first essential of success in this field of work is enterprise. We want the *entrepreneur's* spirit. It should spread in the country far and wide. Then we want a larger diversion of locked-up capital into the fruitful channel of economic development. Money now either idle or but securing an ill return from agricultural lands should be diverted to the starting of large industries. Then, again, the conditions for factory work on a satisfactory basis as between capital and labour should be evolved. Housing of labour, copartnership and generally the pacifying of labour and securing its hearty co-operation with capital in wholesale production should be aimed at. With the growth of the industrial spirit, the spirit to emulate western modes of winning something of the profits to itself will be felt by Labour and unless from the beginning the necessary steps are taken, the evils of capitalism are likely to manifest themselves in this country as well. For this the country must prepare itself from the beginning.

During the month of November 1918, seventeen new companies with an aggregate authorized capital of over 90 lakhs were registered under the Indian Companies Act (VII of 1913) in the Bengal Presidency. The respective details are given below:—

			Rs.
8	Trading	...	75,70,000
2	Oil Mills	...	3,00,000
1	Tea Planting	...	6,00,000
1	Planting other than tea	...	20,000
5	Coal Mining	...	5,50,000

THE FUEL VALUE OF WOOD.

BY W. B. CAMPBELL.

*Forest Products Laboratories of
Canada.*

OWING to the scarcity of coal in the winter just passed (1917-18) many people are becoming more interested than heretofore in the use of wood as fuel. It is the purpose of this short article to discuss the value of different woods in this connection.

The primary quality of a fuel is to give off heat when burned. Secondary qualities are ease of handling, ease of kindling, amount of ash, etc. From a chemical point of view the burning of a substance in air simply means the combining of that substance with the oxygen of the air. This reaction liberates heat in a greater or lesser amount depending on the substance burned. The amount of this heat is measureable and the unit used for practical purposes in this country is what is known as the British Thermal Unit or more familiarly as the B. T. U. One B. T. U. represents the amount of heat necessary to raise the temperature of one pound of water through 1° Fahrenheit.

For every combustible substance there is a corresponding "Heat of Combustion" which is invariable for that substance and is expressed as the number of heat units or B. T. U.'s. given off by the combustion of 1 pound. This quantity is the same no matter how slowly or how rapidly the combustion takes place and it has no direct reference to the temperature of the fire. If combustion is rapid a large number of heat units are produced in a short time and consequently the temperature is high. If combustion is slow the number of heat units per second is small and the heat gets a chance to become dissipated, consequently the temperature is low.

If a fuel is wet the water must all be evaporated during the burning of the fuel and this takes away some of the heat. To

heat up a pound of water from the ordinary temperature to the boiling point, evaporate it and heat the steam to the temperature of the chimney gases requires about 1220 B. T. U. Consequently for every pound of water in the fuel this amount of heat goes up the chimney. This loss is present to a greater or lesser extent with all fuels but is particularly important with wood. Coal may contain 2 or 3 per cent water or 40 to 60 pounds per ton. Green wood may contain 1500 to 2000 pounds of water per cord. Air dried hardwood holds about 720 pounds per cord. The reason for demanding well dried wood is therefore quite obvious.

The next statements may not seem quite so evident but they are equally true. The "Heat of Combustion" or "Calorific Value" is, within narrow limits, the same for all woods. That is, a pound of one wood will give off almost exactly the same amount of heat as a pound of a different wood. This does not mean that a cord of one wood will give the same heat as a cord of any other wood because one cord may be much heavier than the other. Some woods are highly resinous—red pine, for instance,—and these have a slightly higher heating value on this account but the difference is not great. The reason for all woods having equal Calorific Values is not far to seek. Fundamentally all woods consist of the same substance and one species differs from another chiefly by the way this is arranged in the wood structure. Since all woods do consist chiefly of the one substance, the Calorific Values of all of them must be the same. Measurements of the Calorific Value show that 1 pound of *perfectly dry* wood yields 8220 B.T.U. For comparison it may be stated that 1 pound of good hard coal yields about 12,000 to 13,000 B.T.U., and poor coals go very much lower. Perhaps it would be better to compare these in terms of cords and tons. One cord of air-dried maple or birch will contain about 3,250 lbs. of dry wood and about 720 lbs. of moisture. Its heating value will then be

$$\begin{array}{l} \text{Less ... } \left\{ \begin{array}{l} 3,250 \times 8,220 = 26,715,000 \text{ B.T.U.} \\ 1,220 \times 720 = 878,400 \text{ B.T.U.} \end{array} \right. \end{array}$$

giving a net heating value of 25,836,600 B.T.U. A ton of coal gives a net heating value of

$$2,000 \times 13,00 = 26,600,000 \text{ B.T.U.}$$

These two values are very nearly equal so that we can say that *one cord of well-dried hardwood (beech, birch or maple) is equal to one ton of good hard coal.* Other woods have heating values in proportion to their weight per cubic foot.

The following table shows the number of cords of various common woods required to equal 1 cord of well dried hardwood or 1 ton of coal.

Ash	1'10 cords	Poplar	1'55 cords
Basswood	1'70 ..	Cedar	2'10 ..
Beech	1'00 ..	Douglas Fir	1'20 ..
Birch	1'00 ..	Balsam Fir	1'80 ..
Butternut	1'60 ..	Hemlock	1'60 ..
Elm	1'00 ..	Jack Pine	1'50 ..
Maple	1'00 ..	Spruce	1'60 ..
Oak, red	0'97 ..	Tamarack	1'15 ..
Oak, white	0'93 ..		

This table gives approximately the heating value of well air-dried cordwood but the amount of drying is important. Wood piled with the bark on dries very slowly so that when purchasing wood, split wood is to be preferred to small sized round wood since the latter will probably not be so dry and will include more bark and rotten wood which has little heating value.

Some other considerations may at times be as important as the actual heating value of the wood. For instance, the ease of lighting is to be considered if the wood is wanted only for kindling or for a quick fire in the kitchen range in the summer. Cedar and pine are especially good for this purpose. For an open fireplace the hardwoods are best. Spruce makes a very "crackly" fire which is sometimes an attraction but there is always some danger that a spark may be thrown out of the fire to the detriment of clothing or the rug.

Another point worth bearing in mind in connection with the burning of wood in place of coal, is the difference in the amount of ash produced. A cord of hardwood will make only about 50 lbs. of ashes while a ton of hard coal will make from 200 to 300 lbs., judging from the grade of hard coal coming to Canada during the past winter (1917--18), the latter amount is more likely, and some lots will run even higher than this, especially the small "steam sizes." The calorific value of these latter may frequently be as low as 10,000 B.T.U. in place of the 13,000 B.T.U. used in the above calculations.

THE ART OF ECONOMIC DEVELOPMENT.

BY "VIATOR."

IN our June number we reviewed at length the first of a series of articles on the Art of Economic Development which Professor Jevons is publishing in the *Indian Journal of Economics*. The second article of the series is now before us and our readers will, we are sure, be glad to know the lines on which Professor Jevons develops his theme. It will be remembered that his object is to lay down the principles which should guide those who are responsible for the economic development of any tract of country. The first step is the preparation of a programme. The second step is to call in the engineers and to determine the cost of the proposed works, the rate of return which they promise and the time needed to complete them. It is at the third stage that the aid of the financier is invoked and it is with this stage that Professor Jevons is concerned in the article under review. It is the business of the financier to provide the ways and means, to investigate what funds may be available and to what extent borrowing can be resorted to. Professor Jevons commences by pointing out that the theory of finance is not intrinsically difficult and that it seems difficult only because it has never been converted into an ordered body of precepts, logically developed from a scientific study of financial operations. He defines finance as the art of regulating the transactions of any individual or corporate body connected with the acquisition, care and expenditure of money so as to achieve a certain aim or end or set of aims. The science of finance investigates and treats of all the monetary transactions of individuals and business firms and of all corporate bodies, whether public, such as the State and Municipalities, or private, such as companies and

charitable associations. Professor Jevons considers that, for many purposes, it is convenient to distinguish between private and business finance and that, again, business finance should be divided into partnership and joint stock finance. The transactions of non-profit making institutions such as societies and clubs he calls association finance. The term public finance he reserves for the finance of municipal and district councils and of the State itself, whether as provincial or central government.

In our opinion, Professor Jevons rightly insists that whether financial operations are carried out by private individuals, corporations or the State, the underlying principles must remain the same. An infinite amount of waste of public money would have been avoided if this dictum had always been acted on. He considers that one peculiar merit of company management is that it forces the persons in control to learn the elementary principles of finance.

The next step is to define the true function of the financier whether in business or in Government. It is for the political leaders or members of the Government in power for the time being to decide on policy. The financier has then to make all the necessary arrangements to enable the policy or projects adopted to be realized. His true aim is to secure the greatest efficiency in reaching the objective by the proper disposition of the monetary transactions. On the other hand, the financier in business must be concerned with management and in Government with policy to the extent that financial consideration of ways and means may veto or limit particular proposals for action and he must know enough of business or politics to see that no injury to his firm or to the population at large results from his financial measures. When Professor Jevons publishes his articles in book form, as we hope he will shortly, we should be glad if he would enlarge on this point. It is, clearly, his view

that the financier should have a voice in determining policy, but not a controlling voice. It would be interesting to have his opinion how far this is the case when the Prime Minister is also Chancellor of the Exchequer.

After emphasizing the tremendous loss to individuals, business firms, local authorities and the State which would be saved by the wide diffusion of a proper understanding of the fundamental principles of finance, Professor Jevons commences to formulate these principles by defining the three distinct systems of finance which may be recognized. These are the system of predetermined income, the system of predetermined expenditure and the commercial system. The income of an individual is predetermined when he is employed in a permanent position either at a fixed salary or at a salary increasing according to a prearranged scale. The income of a State or territory which is in a primitive or undeveloped condition is also predetermined. During the later days of the Moghul Empire and the earlier years of British rule, the income of India was incapable of expansion at the will of Government and hence the system of finance forced on the Government of India at the outset was that of predetermined income. This system has remained in vogue in almost all British and Native State finance in India owing to the fact that land revenue makes up so large a proportion of the income of the State and that permanent or long term settlements have been adopted. The system, perhaps, is not quite so rigid as Professor Jevons describes it. The policy in regard to enhancement of land revenue in the past has not been entirely uniform. There have been times when the necessity of making ends meet has meant greater severity in enhancements than at more prosperous periods.

The system of predetermined expenditure is obviously the opposite to that of predetermined income. Here it is the expenditure rather than the income which is determined beforehand. Few individuals are in the

happy position of being able to adjust their income to their expenditure and those curiously enough, belong to the classes which are usually regarded as the poorest. The instance Professor Jevons mentions is that of the casual labourer who in India as elsewhere, is given to working only when he is short of the means of subsistence or when some special need arises. In other words, he may be said to decide what he wants to spend and then to use a part of his leisure time to work just sufficiently long to meet the expenditure determined on. In the realm of State finance, it is the more advanced nations which conduct their finances on this system and English finance gives the best example of it, both in national and local and municipal finance. The budget of expenditure is prepared on the basis of the public needs which are considered to be urgent. The income is adjusted to the expenditure as exactly as possible by additions to or reductions of taxes or rates and the budget usually provides for a small surplus as a margin against possible under-estimation.

In the commercial system of finance, neither income nor expenditure is predetermined but both may be varied from time to time and, in fact, must be varied if business is to be carried on successfully, for he finds that, by so doing, he obtains more than an equivalent increase in his income. The important point is that the commercial system of finance is applicable to all commercial undertakings, whether carried out by an individual company or by Government. That sounds obvious enough, but the Governments of most countries, including India, have often failed to realize the difference between this system and the two previously mentioned and their failure has spelt disaster to many of the enterprises they have undertaken.

The ultimate security for public debt is what Professor Jevons calls the taxable capacity of the community. This he defines as the surplus produce of the people above what is necessary to maintain existence

according to the standard of life prevailing at the time in the country concerned. As Professor Jevons admits, the definition is not very exact. The American economist, Mr. Devas, lays down that whenever taxation, instead of being drawn from superfluities, makes an encroachment on absolute or conventional necessities and threatens to lower the standard of life, the people are being taxed above their taxable capacity. Here, again, more precision seems required, especially in regard to the term "conventional necessities." It is supplied by Professor Marshall, who considers that the conventional necessities are those to obtain which the average man or woman will sacrifice some things which are necessary to efficiency. The taxable capacity of the people is thus the extent to which the total social income (that is, the sum total of all the individual incomes received by the persons composing the community) can be diverted into the coffers of Government without reducing the consumption of the necessities of life, absolute and conventional, to such an extent as to impair the efficiency of the people as workers. It need hardly be pointed out that the luxuries of life in the case of one class of people may be absolute necessities for another class and it is, therefore, impossible to arrive at any precise measure of taxable capacity. Professor Jevons, however, makes an interesting attempt to do so and, for this purpose, divides the people into two classes, Government servants, civil and military, whose salaries are paid out of the taxes and land revenue and rents received by Government, and the rest of the population, including all Government employees in commercial services such as the Post Office. The second class expends its income in four great groups of payments, necessities, taxes, investments and superfluities or luxuries. The taxable capacity of the people, therefore, consists of the social income of the public which actually pays the taxes together with

that part which is spent on superfluities plus that part of the income of Government servants which is spent on superfluities. The difference between the two classes into which Professor Jevons divides the people lies in the part of their income which is spent on taxes. If the full salaries paid to Government servants are included in the social income, then the whole of the taxes paid by them must be included in the estimate of the total taxable capacity. At this stage, Professor Jevons coins a new phrase, "minimum social expenditure," which means that portion of the social income which is expended on necessities, absolute and conventional, and is, therefore, the minimum expenditure on which society can exist. Each class of the community has its own minimum social expenditure and its own taxable capacity and for this reason, it is impossible to devise any system such as could absorb the whole taxable capacity of the people. Before such a limit was reached for all classes, some would inevitably be taxed beyond it. In Professor Jevons' opinion, any system of taxation which endeavoured to obtain more than 70 or 80 per cent of the theoretical taxable capacity would be likely to be oppressive. This figure seems to us very high indeed. Later on in his article, Professor Jevons mentions that, before the war, the taxation in most European countries was probably not more than one-fourth to one-third of the taxable capacity, except perhaps in Italy. Taxation up to 70 or 80 per cent of taxable capacity would certainly mean the end of many, if not of most, of the amenities of life for the classes which are now regarded as well-to-do, and would involve a sacrifice on behalf of generations yet unborn which it appears somewhat unreasonable to expect. But the war has proved that there was a considerable opening for increased taxation in European countries. Heavy taxation in excess of the taxable capacity may be imposed and maintained for a short period, say five or six

years. Possibly, during the last two or three years, the United Kingdom has been taxed beyond its taxable capacity though we doubt it. Considerations of space prevent us from describing the two methods by which Professor Jevons thinks that an estimate of the taxable capacity of the population inhabiting any territory could be framed on a statistical basis. He passes on to consider the results to be gained from increased taxation. The effects of such taxation, in the case of individuals, vary according as the taxation is direct or indirect, *i.e.*, according as it is in reduction of income or is based on commodities. If it is in reduction of income, the individual curtails his expenditure in different directions in varying degrees. There are some forms of expenditure—the cynical person might point to charity as an example—which he can give up without a pang. Professor Jevons puts the case in more technical language when he says that the individual will curtail to the greatest extent expenditure on those commodities or forms of enjoyment for which the marginal utility functions (utility curves) are most elastic. In the case of taxes on commodities he reduces his expenditure according to the extent to which the commodity is a necessity to him or, again in the technical language of the economist, "in accordance with the elasticity of his utility curve for the commodity in question, and the extent of the rise of price." Of more importance in connection with Professor Jevons' main theme are the social results of increased taxation. These are of two kinds, those which are consciously sought by the Government or other organizations of the community and those which occur unconsciously and spontaneously. The first of these classes can again be divided into two. The first sub-class comprises the primary reactions of the tax itself, such as a decrease in the consumption of alcohol due to an increase in the tax on it. The second

sub-class consists of the results due to changes in the environment of the people brought about by the expenditure of the money raised by taxation upon providing public works or improved housing and sanitation and, indirectly, by education. In this sub-class are also included the subjective changes which enable people more fully to assist one another and to benefit by and enjoy their improved environment.

As a preliminary to dealing with the results flowing from increased taxation, more especially in bringing about changes of environment, Professor Jevons discusses the form of government in relation to the control of public expenditure. The autocratic form of government, in which is included bureaucratic government, and which Professor Jevons designates "government by control," may be very good or very bad but, in neither case, has the people any voice in the regulation of public affairs or their own welfare so far as it is affected by the general environment. Democratic government, on the other hand, is merely the supreme executive organ of the people themselves, and in the perfect democracy, marginal equilibrium would be maintained between public and private expenditure exactly analogous to the equilibrium between the private person's expenditure in different directions. In less technical language, the people would themselves decide whether money should be spent in satisfying communal wants such as schools, sanitation or communications rather than on their own private wants as individuals. Professor Jevons shows that, in a democratically governed State, the system of predetermined expenditure is adopted as the result of the balance between wants most easily satisfied by communal effort and those most advantageously satisfied by private action.

Few even of the most ardent believers in democracy will differ from Professor Jevons' view that the control of expenditure is a serious weakness in the democratic system

of government which can act only with the average intelligence and foresight of the people as a whole. The inevitable weakness of democracy can, Professor Jevons thinks, be overcome in two ways. The first is for the whole community to be familiarised with the principles underlying economic development so that they may come thoroughly to understand the need for careful planning of expenditure years in advance of the realization of benefits and also learn the necessity for subordinating purely local interests to the achievement of ultimate general efficiency. As an instance of the subordination of general to local interests, the pressure brought to bear in Australia and America on the State Government to get a particular bridge or branch railway constructed is mentioned. This sort of pressure is not entirely unknown in England and Ireland might certainly have been added to the category. In India, Professor Jevons thinks, a mistake has been made in handing over the control of making new roads and light railways to District Boards thereby encouraging the satisfaction of immediate local interests at the expense of delaying the general benefit of the community which would flow from plans contrarily initiated and controlled. He is not at all hopeful in regard to the possibility of educating the whole community to a sufficient understanding of the principles of economic development for them to be able to control it directly through their elected representatives. It is not an impossible process but it will be a very slow and lengthy one. The second method he suggests for overcoming the weakness of democracy in the matter of control of expenditure is likely to prove more fruitful of results. It is to convince the people and their representatives not only that scientific development by an ordered programme is enormously important but also that it is an inherently complex and difficult business which should be handed over to experts. Those experts must, of

course, be given the requisite funds for the purpose. In the case of Government by control, matters are obviously simpler and once Government has realised the principles of economic development and the advantages of applying them, there is no difficulty in appointing its experts. The body of experts, once appointed, should be given full control of public works and other directly economic measures and should, at least, be consulted about, if it is not placed in charge of, the reform of housing and sanitation. For the purposes of economic development Professor Jevons classifies the expenditure required for changes in material environment under five heads. The first is expenditure which has a directly pleasing effect such as that on new parks and public buildings. The return from this is not economic but takes the form of direct enjoyment. The second is expenditure which is productive of health and therefore of efficiency in economic production such as that on sanitation and garden cities. The third and fourth classes are those in which the expenditure is either immediately economically productive as in the case of some roads and railways or becomes so after some years as in the case of docks, irrigation works and some railways. The last class is expenditure which is economically productive but only with slow cumulative effect such as that on education, on improved land tenure or agricultural instruction. The return from this is delayed but it gradually becomes very great indeed.

Professor Jevons concludes the article under review by an examination of the effect of expenditure of these classes on the taxable capacity of the people. Expenditure of the first class obviously has little or no effect on taxable capacity whereas that of the remaining four classes tends sooner or later to increase it to a very considerable extent. The increase in efficiency resulting from improved sanitation or housing may, in the course of a few years, increase taxable capacity by

200 or 300 per cent, more than the increased taxation necessary to pay for the sanitation or the housing. After thirty years, a railway or irrigation work may easily repay its cost every year in increase of taxable capacity. If the future return in taxable capacity resulting from expenditure on education, taking as initial expenditure say the total of recurring expenditure during a period of three years were reckoned, Professor Jevons thinks that thirty years later, the increase of taxable capacity which could be imputed to it—provided it were possible to trace it separately—would be equal to the whole three years' expenditure.

It will naturally be asked why, if expenditure on changes in the material environment produces the results stated by Professor Jevons, the world is not progressing in wealth and taxable capacity at a speed which would make every body immeasurably better off in a generation. Professor Jevons gives two reasons why progress is so much slower than his figures would lead his readers to expect. The first is ignorance of the enormous possibility of such outlay together with wastefulness un-coordinated and ill-conceived efforts and the second is the fact that capital has to be invested and a burden of expense incurred whilst waiting for the return. Every scheme for a new public work or for any reform of an educational or social kind means putting a burden on the taxpayers in advance of the benefit which will later on accrue in the form of increased taxable capacity. The number of new schemes which can be taken up at one time is limited by the existing margin of taxable capacity which is not already taxed and the extent to which the people's wishes or political considerations allow this to be trenched on. It is for this reason that the relation of taxable capacity to economic development is so important. The greater the unused margin, the greater the opportunity of putting in hand schemes and reforms the

benefits of which take time to mature. In a democratic country, the people at large have to be educated to understand this relationship and to be willing to make some present sacrifice for the certain future prosperity of their country. In a country which is governed by control, the Government can safely proceed with a reasonable programme of public works and measures involving the gradual increase of taxation which should be as widely distributed as possible. Government should, however, take the public into its confidence in regard to what it is doing.

In the remainder of his section on Finance, which we have been privileged to see in proof, Professor Jevons discusses the question of the extent to which expenditure on economic development should be met from current revenues or from loans. Our review of a singularly interesting and informing article has, however, run to great length and we shall, therefore, follow Professor Jevons' example and break off at this point. We hope to return to the subject at a future date.

LARGE AND SMALL HOLDINGS IN ENGLAND.

BY K. KUNHIKANNAN, M.A.

AT this time when attention has been drawn to the fragmentary character of the Indian holdings and the reduction of a considerable percentage of these beyond the economic limit, the history of large and small holdings in England will not be without interest. Widely different as the conditions of the two countries are, a study of the precise effect of economic, social and political factors on the character and size of holdings in England may afford some clue as to the solution of the problem in India, the more so because in English Agricultural History, periods of *petite culture* have been followed by capitalist farming and when this latter had persisted for long and seemed secure against changing conditions the tendency to a reversion to small holdings again appeared.

Before dealing with the causes which led to this alternating predominance of large and small holdings it is necessary to refer briefly to the economics of the various classes of holdings in England. What is classed as a large holding in India would not come under that heading in England. The small holdings which preponderated in the 18th century consisted of (1) Small plots owned or leased by day labourers who worked them as a subsidiary occupation, (2) Small Farms worked usually by the tenant and his family who depended on them solely for support, (3) the holdings owned and worked by the Yeomenry who also employed little outside labour. The sizes of these three classes of holdings varied with the locality but usually the first kind never exceeded five acres, the typical holding of the second order ranged between ten and twenty-five acres and in particular tracts between fifty and sixty acres. The difference in size between the

An advertisement which appeared a short while ago in a Berlin paper offered soft, delicate clinging fabrics of artificial silk and paper for ladies' and children's use. Skirts of washable paper fibre sell readily; and aprons, petticoats and stockings are being made from paper wool. Blankets and counterpanes, blinds, and even bathroom towels are being made from materials woven from paper and wood pulp, and commoner clothes such as are used for shirtings, undervests, and children's underclothes are made entirely from paper. It is said that this paper material will stand washing twice or even, with care, three times, after which it goes to pieces. It is difficult to mend in the ordinary way, the materials most favoured for repair work are a tube of seccotine and a copy of the *Deutsche Tageszeitung* or of *Lustig Blatter*.

second and third was very little but some properties of the Yeomenry reached a hundred acres. Besides these three classes there were the large farms varying from hundred to a thousand acres. These were first formed in the 15th century when the flourishing trade in wool with Flanders gave an impetus to sheep breeding and rearing which is always best done on large farms. These large farms, however, were far from numerous in the 18th century because during the intervening two centuries there was a reaction in favour of small holdings.

From the very small holdings very little came to the market as their produce was hardly sufficient for the support of the families working on them. The tenant farmer and the Yeomen grew little corn for the market but they excelled in the lesser branches of agricultural produce as beef, mutton, pigs, poultry, fruit, vegetables, eggs, butter and milk, all those in fact which cannot be left in the hands of hired labour but require the personal interest and attention of the owner. On the other hand, on large farms corn growing was the sole occupation as hired labour could not be trusted with the more mechanical processes to which it had been reduced and as it was more quantity than quality of labour that was required. It follows from these features of the various types of holdings that the predominance of large or small holdings at any particular time will depend on what kind of produce whether corn or minor produce of the small holdings fetches the highest return for the capital and labour employed.

With this brief reference to the economics of the large and small holdings, it becomes easy to follow their history through the 18th and 19th centuries. In the first half of the 18th century the price of wheat was only 34s. 11d. whereas in the last decade of the 17th century it stood at 45s. 8d. During this period the population rose rapidly in

wealth and in numbers and along with it the wages of the labouring classes so much so that the latter could afford the consumption of meat, butter and eggs. The small holdings which produced them were, therefore, in a very flourishing condition. The large farmers had on the other hand to face a serious fall in the price of the one commodity they produced, *viz.*, corn. They continued to pay rents based on the prices at the end of the 17th century. They were not, however, in serious distress for William III's bounty on exported wheat stimulated export and tended to keep up prices. Nevertheless conditions were too unfavourable for the extension of large farms either in area or number.

In the second half of the 18th century these conditions were completely reversed. Food harvests became the exception rather than the rule. The supply of home grown wheat fell short of the requirements of a rapidly growing population. England began to import corn instead of exporting it. And this import ceased under the continental system of Napoleon by which he isolated England during the French wars. The result was a continuous rise in the price of corn from 34s. 11d. between 1760 and 1765 to as much as 122s. 8d. in 1812 or by nearly 360 per cent. During the same period the wages rose only by 60 per cent. These were famine conditions which speedily produced a terrible deterioration in the condition of the masses. The demand for fruits, vegetables, meat, etc., diminished to a corresponding extent and the tenant farmers and the Yeomenry who produced them were adversely affected. The large farmers found themselves in an immensely better position. Corn was most profitably grown on them. The labour-saving implements were best employed on them. Their tenants were drawn from a more intelligent and better educated and wealthier classes were therefore less conservative to Agricultural practices. They could employ more capital for the

extensive operations of fencing and drainage. This class alone among the agricultural population prospered and was swelled by men drawn from other walks of life. The number of large farms thus rapidly multiplied at the expense of the small holdings.

The small holder could not face the new situation both by training and habit. He had not the capital nor the inclination to depart from existing methods and even where he was inclined he could not produce corn as cheaply as the large farmer. There was even a greater obstacle in the old common field system with its traditional intermixture of stripe, customary regulation of tillage and common rights of pasture which did not allow any alteration in the traditional methods of cultivation. He could not escape a general rise in rents which the large farmer paid with ease, nor was he any longer a welcome to the large land owner who could more easily collect his rents from a few prosperous tenants than a host of small tenants always in difficulties and who had to spend less on buildings and repairs when farms were few.

Under these adverse conditions the small holdings rapidly disappeared. The land holding day labourer was the first to go, next followed the tenant farmers who could not pay the enhanced rents, sometimes ten times what they were before. Of the Yeomanry who had to pay no rents many became indebted and were finally ruined by the expenses of enclosure forced on them by neighbouring landlords. Others finding the enormous rise in the price of the land sold out their properties and became large farmers. The land released from all these classes went to enlarge the large holdings.

On the economic side the consolidation and extension in area of the farms resulted in a most gratifying increase in production. The supply became equal to the demand. There was a rapid improvement in technique and methods. But it was at a tremendous sacrifice. It degraded to the

position of day labourers what had been a numerous and flourishing class of small tenants and independent proprietors. And even the labour for wages, to which they were condemned, was obtained with difficulty and paid miserably for the labour market became overstocked and wages had fallen. The country as Goldsmith put it was a "Garden and a Grave." There was no alternative but to migrate to towns to find employment. It was fortunate that this revolution in Agriculture took place about the same time as the rapid development in industries. Otherwise the distress of the Agricultural proletariat which the revolution created might have had serious consequences. As it was, it produced that rural exodus which social reformers have always lamented and which has not been arrested to this day.

The large farms continued to increase till the last decade of the last century. On the close of the French wars in 1815 the landowners anticipating a fall in the price of wheat passed the Corn Laws thus effectively shutting out imports. These laws continued till 1846 and under the artificial inflation of prices created by them the large farms continued to increase in extent and number. The condition of the labouring poor went from bad to worse, the demand for labour in towns as well having fallen off as a result of the frequent industrial crises which occurred between 1817 and 1845. The small holdings had, therefore, no chances whatever in the face of the diminished consumption of the commodities they produced.

When the Corn Laws were finally abolished in 1846, it was expected that the free import of foreign corn would bring down prices but the large farmers were equal to the occasion. Reckoning on low prices they employed every means to diminish the cost of production, such as artificial manures, improved implements, drainage, etc. They combined pastures with arable farming for the demand for meat had risen with the rapid revival of Industries and the

rise in the wages. The manure from the animals kept went to fertilize the corn while these improved methods diminished the cost of production. The expected fall in the price of corn did not take place. The large farming system, therefore, far from being adversely affected reached its highest level during the thirty years following the abolition of the Corn Laws.

But from the year 1870 onwards just when the large farms had almost a century and a half of continued prosperity and appeared secure comes a change. The price of corn rapidly fell as a result of the cultivation of enormous tracts of virgin soil in Canada and Australia and transport became quick and cheap. Scientific technique and capital were unequal to this combination. Furthermore, the increase of wealth of all classes raised the standard of living and fruits, vegetables, dairy produce, etc., the branches in which small farming excelled, were in great demand. The new economic situation thus favoured the smaller unit of holding and they tend to increase while the large farms are no longer taken up for growing corn. Between 1870 and 1900 the area of arable land fell from 24 to 19.5 million acres and pasture land (in small holdings) rose from 22 to 28 million acres. To this economic tendency are offered serious social and political forces. Land in extensive and continuous blocks is in great demand among the wealthier classes for partridge shooting and other social amenities. They purchase it not as an investment but rather for the social prestige and political influence it brings. This hindrance to an economic tendency is being gradually removed by legislative interference. For the conversion of farms into shooting preserves had made England increasingly dependent on foreign countries for her food, a dependence which has been strikingly demonstrated during the present War.

From this short historical review, it would appear that there are particular types of

holdings suited for particular branches of agriculture. Where quality rather than quantity of labour counts and the personal interest and attention of the owner are important elements in success as in dairying, stockfarming, fruit and vegetable growing, the small holding is the type best suited. In those branches of Agriculture in which the farm operations have been reduced to a series of mechanical processes carried out by labour-saving implements and in which intensive application of capital rather of labour is required, the large farm pays best. One or other of these types has predominated in accordance with the relative demand for the products of each. When animal produce, vegetables and fruits fetched comparatively higher prices than corn, the small holdings flourished and increased in number. When corn was dear and the demand for minor products fell off the large farms preponderated. An equally interesting conclusion is that improved methods and technique are more profitably and economically employed on the large farm, whose tenants drawn from a wealthier and more educated class will more rapidly and effectually adjust themselves to changing conditions. But even they cannot achieve economic impossibilities.

Intimation has been received from His Majesty's Secretary of State for India that it is no longer necessary to submit priority applications to the Ministry of Munitions for material required from the United Kingdom. The Indian Munitions Board will still, however, be prepared to assist in the case of urgent demands. In such cases applications should be submitted, in duplicate, on the existing form, to the local priority authority concerned. If the Indian Munitions Board is satisfied as to the grounds of urgency, a telegraphic recommendation will be made to the Secretary of State for India subject to the conditions now in force with regard to telegraphic recommendations.

CHEMISTRY AND THE ARTS.

BY R. PALIT.

THE wants of civilization and the effects of competition require the effective application of increased power, with regard to economy both of labour and of time; and, in the gratification of these wants, there is a constant aim to render objects, apparently of little value, useful and productive. The benefits conferred upon industry by mechanical science are also afforded still more strikingly by her younger sister—chemistry. In examining the various applications of chemical science to manufactures, we find that they naturally divide themselves into the following three heads:—

- (1) Chemical appliances, which have added to human power either by furnishing substitutes for mechanical contrivances, or by affording tools and methods for arriving at results formerly impossible.
- (2) Methods of producing economy of time, generally resulting from a constant tendency to simplification.
- (3) Methods of utilizing products apparently worthless or of endowing bodies with properties which render them of increased value to industry.

When a manufacture is already established, the results of competition not only compel an increasing attention to the economy of power or of time, but also require an increase of the industrial value of the article offered for competition. He who can replace an expensive mechanical power by a cheap chemical process or can economize production by the happy adaptation of natural forces, must possess advantages over his less skilful competitors. Vulcan produced his

works more economically than the more mortal blacksmiths of his time, by availing himself of the fires of Mount Etna for his forges. The possibility of doing what previously could not be done generally has a moral as well as a physical result. The communication of a new power often occasions great social changes.

It has justly been said that the discovery of the Greek fire projected from the walls of Constantinople "saved Europe from desolation by the Saracens"; and it is equally true, that the personal animosity of warriors and the hostile spirit of nations have been much subdued by the new system of tactics introduced when a German Monk, in deflagrating a mixture of sulphur, nitre and charcoal, discovered gun-powder. Morality was improved and crime lessened, when the brilliant lighting of our streets by the introduction of gas made every passer-by a detective policeman.

In addition to the direct communication of power, the increased economy of time resulting from chemical appliances is of immense importance in manufactures. This sometimes follows the discovery of new bodies endowed with peculiar properties, but it far more commonly arises from the reduction of a complex to a simple process. It is with chemistry as with mechanics; the progress of discovery is in the direction of simplification. The simplification of complex processes is the economy of labour, the husbanding of wealth. Industry, in its progress, continually finds more ready means of cultivating and reaping fields long in its possession. We believe many of our readers are familiar with the story of poor Ho-ti and the pig, told with such delightful vivacity by Charles Lamb. When Ho-ti's house, containing a litter of pigs was burned to the ground, it was natural, as a consequence of this discovery, that the inhabitants of Peking should introduce pigs into their houses, and burn them down, when they desired to participate in a dish so savoury; but it was

a great discovery when an ingenious person found that a common fire would equally do well, and that it was not absolutely necessary to burn down a house every time a pig had to be dressed. "By slow degrees," concludes the Chinese history, "do the most useful and seemingly the most obvious arts make their way among mankind." The moral of this well-known story is of everyday occurrence in the chemistry of arts. Not a year passes without the most mature processes of manufacture being further simplified and economized.

It is with industry as with nature; many of the lower animals have a repetition of organs, destined for the performance of functions similar to those exercised by single organs in the higher animals. Various stomachs and several eyes in the lower animals are not more effective than one stomach and two eyes in man. The law of repetition of organs is like the complex processes of manufactures, represented by fewer but more perfect methods as civilization advances. The industrial position of Europe has been gained by her perception of this truth, and by her constant endeavours to replace complex processes of manufacture by means more simple and perfect.

The third division, into which we would divide chemical applications to industry, is one peculiarly characteristic of advancing civilization. European nations, as their wants increase, examine every material, to see if it could be adapted to their needs. Using their heads for sublimer purposes, they observe and investigate the phenomena and properties of each body, so as to ascertain how far it may be made subservient to their desires. In these investigations chemistry offers vital aid; she, like a prudent housewife, economises every scrap. The horse-shoe nails, dropped in the streets during the daily traffic, are carefully utilized by her and re-appear in the form of swords and guns. The bones of dead animals yield the chief constituent of lucifer

matches. The dregs of port-wine, carefully rejected by the port-wine drinker in decanting his favourite beverage, are taken by him in the morning, in the form of Seidlitz powders, to remove the effects of his debauch. The offal of the streets and the washings of coal gas re-appear carefully preserved in the lady's smelling-bottle. This economy of the chemistry of art is only in imitation of what we observe in the chemistry of nature. Animals live and die; their dead bodies, passing into putridity, escape into the atmosphere, when plants again mould them into forms of organic life; and these plants, actually consisting of a past generation of ancestors, form our present food.

The manufacture of iron from the native ores has been greatly facilitated by the knowledge of chemical science. The mode of smelting iron consists in mixing the ore with lime and coal, the former producing a slag or glass with the impurities of ore, while the coal reduces the oxide of iron to its metallic state. Much heat is spent in the process of smelting, but the cold air blown in, as the blast, lowers the temperature, and compels the addition of fuel, as a compensation for this reduction. Chemistry pointed to this loss, and now the air is heated before being introduced to the furnace. The quantity of coal is wonderfully economized by the application of science; for, instead of seven tons of coal per one ton of iron-ores, three tons now suffice; and the amount produced in the same time is increased nearly 60 per cent. Assuredly this was a great step in advance. Large quantities of ammonia, which were annually lost before the days of Chemistry, are now readily collected and utilized. So it is needless to state that the chemical science has added to human power, by increasing production and economizing to a great extent both the time and the materials employed.

Without the aid of chemistry it would have been impossible for textile fabrics to have attained their present development. The

bleaching of cotton and linen was not much practised until about 150 years ago; before that time they were sent to Holland, where the operation of bleaching consisted in steeping them in potash for a few days, afterwards for a week in butter milk, and exposing them for several months on a meadow to the influence of the sun and the moisture. A great improvement was made in Scotland by substituting sulphuric acid for sour milk; and the immediate effect was to reduce the time from eight to four months. In 1785, a French chemist suggested the use of chlorine as a means of hastening the process, and in the last year of the 18th century, a compound of this gas with lime was introduced by Tennant of Glasgow. The development of cotton manufacture now became immense.

By a happy adaptation of the chemical processes, in conjunction with the bleaching power of chlorine, the time required for the whitening of cotton and linen fabrics was at once reduced from months to hours; while the miles of outstretched calico, defacing the verdure of country districts disappeared, the whole operation being carried on within the small space of an ordinary factory. Our readers may well imagine what an impulse chemical science gave to a trade so important as this. The bleaching of calico now consists of a chemical operation of great precision.

We cannot but refer to the triumphs of chemistry in calico-printing—an art which has grown with its growth and become stronger with its strength. The knowledge of mordants and of colours are the results of chemical discoveries. Lapis Lazuli, long celebrated for its beautiful blue, almost ranked among the precious stones, and was sold at a price which put it quite out of the reach of the calico-printer. But chemists ascertaining its composition by analysis, soon learned how to make it by synthesis.

The application of chemistry to dyeing

deserves especial attention. Madder, the dye most commonly used for calico, after imparting its colour, was considered useless. The large quantities of spent madder constantly accumulating were found exceedingly inconvenient. It was not valuable enough for the manure heap, and the rivers became polluted in carrying away the waste material. But chemistry has shown that actually one-third of the colouring matter is thus thrown away, and that simple treatment with a hot acid again renders it available as a dye. These waste-heaps are now sources of wealth, and the dyer no longer poisons the rivers, with spent madder, but carefully collects it, in order that the chemist may make it again fit for use.

Stannate of soda is a salt largely used by calico-printers. The usual mode of preparing it was: (1) tin was reduced from its ore; (2) this tin was dissolved in muriatic acid; (3) it was oxidized by nitric acid or chlorine; and (4) the oxide thus formed was precipitated and re-dissolved by soda, this bulky, aqueous solution being furnished to calico-printers.

Mercer simplified the process and obtained it in the solid state by two operations: (1) the tin was obtained as before; (2) this tin was fused with a mixture of nitrate of soda and caustic soda, the former oxidizing it, and the latter forming stannate of soda with the oxide thus formed. The common ore of tin is an oxide; why, then, was it necessary to reduce it to the metallic state merely to oxidize it again? He, therefore, fused the ore at once with soda, the impurities remaining undissolved, and the salt was made by one operation. We quote this instance as a remarkable example of the tendency of chemistry to simplify processes of manufacture.

We might refer to the important discoveries of yellow and red prussiate of potash, the former of prussian blue; but this would only be to cite one out of innumerable appliances. We prefer, therefore, to finish

this part of the subject, by alluding to the resists and discharges used in calico-printing. In order to preserve white patterns in the process of dying, in India, whence calico-printing originated, mechanical devices are still employed, each white spot being covered with sealing-wax, or by being tied up and protected from the dye. By the aid of chemistry, we either discharge the colour on the cloth, or we put upon it bodies which resist the action of the mordants and prevent the colour attaching to that particular part. Acids made from the lees of wine (tartaric acid) and from the lemon (citric acid) are now largely used in these operations, and hence come the beautiful patterns we enjoy in our dress. It was found that, even when the whites were thus obtained, they became soiled in washing off the excess of mordants from the other parts of cloth; and the only mode of preventing this was, to treat the cloth with a bath of cow-dung. So, nothing can be gainsaid against the triumphs of chemistry in the dyeing of textile fabrics, whether of cotton, wool and silk or their mixtures; and we endorse the dictum that without the application of chemical science to the dyeing of textile fabrics, we would not have obtained so cheaply the beautiful patterns we enjoy in our dresses.

Chemistry is the foundation of those arts which furnish us with saline substances—an order of bodies highly useful in the affairs of common life. The successful manufacture of glass and various kinds of pottery, matches, soaps, etc., requires chemical knowledge of the substances employed, of their possibility as affected by difference of proportion, or by the admixture of foreign substances, and of the means of measuring and regulating high degrees of heat. The successful manufacture of bricks and tiles requires a knowledge of chemistry.

Formerly, the shavings of leather were treated as waste, scarcely fit for the manure-heap, but chemistry has shown that they contain much nitrogen which renders them

well-adapted for the formation of the beautiful colour, known as Prussian blue.

The manufacture of candles has been much improved by the aid of chemistry. Tallow candles or their more expensive substitute wax, were used before. The tallow itself was impure, containing cellular tissue, which was only partially removed in the form of a scum. This impurity rendered the light unsteady, and obstructed the wick. The old method of purification has been replaced by a new one in chemically treating the tallow with sulphuric acid and melting by steam. Much of the impurity is thus removed and purer tallow is obtained. But the researches of Chevreul proved that fats consist of fatty acids, combined with a kind of sugar named glycerine, which required to be removed, and this glycerine plays an important part in the world of drugs.

We thus see that a great transformation has, of late, taken place in the sphere of many of the useful arts that contribute to the comfort of man, and this has mainly been done by researches in the domain of chemistry. It is a hopeful sign of the times that many of our young men now betake themselves to this branch of science and are trying to help forward the industrial regeneration of India in a tangible way.

A recent development in the metallurgical industry which merits comment is the very great increase in the production of steel made by electric furnaces. According to Professor Carpenter, F.R.S., of the Imperial College of Science and Technology, previous to the war the output was so small that it did not figure in any returns of steel production. Nevertheless, in 1917 no less than 110,000 tons of electric steel were made, of which 90,000 tons were in the form of ingots and 20,000 tons in castings. At the present time upwards of fifty furnaces are at work in the various Sheffield works.

COLLECTION OF FUNDS FOR ECONOMIC PURPOSES.

BY R. TIRUNARAYANA AIYANGAR,

B.A., B.L.,

District Economic Superintendent, Kolar.

THE collection of funds for Economic purposes is of the utmost importance. The Village Improvement Committee, the Town and Taluk Progress Committees and the District Committee will all have more life put into them if they have got decent funds to administer. Any ambitious scheme of obtaining large sums of money by means of contributions, subscriptions and otherwise, will be more an interesting reading of statistics than one suitable for practical working. Above all a steady and assured annual income, however small, is what is most desirable. If the question of collecting a Common Fund for each village is satisfactorily solved, the funds for the several committees would also be assured.

In the Circular appended to G. O. No. R. 9034-43—L. R. 10-14-139, dated 19th April 1915, collecting a Village Fund is the prescribed as one of the Primary or Obligatory Duties of the village agency:—

"Each family in the village may be induced to contribute something every year according to its means towards the formation of a Village Common Fund in addition to the weekly labour, and special contributions for supplementing Government grants or other special works. Advantage may also be taken of marriages, festivals and other social and religious gatherings, as well as other auspicious occasions to obtain voluntary contributions. The funds raised in the village should on an average amount to not less than as many rupees as there are families in the village.

The Committees shall have full power to utilize the common fund for any work of common benefit to the village with the approval of the villagers as a whole at a meeting convened for the purpose....."

The collection of the Village Common Fund in cash is beset with many difficulties.

The raiyat is likely to feel it a hardship, especially, as this contribution is to be in addition to the weekly labour, and special contributions for supplementing Government grants or other special works. In the next place the collecting agency, which for some-time to come could only be the present set of village officers, is defective and there would be much scope for leakages. There are likely to be many complaints and as it is only a voluntary contribution many a villager might cease to pay if his grievance is not redressed to his satisfaction. The best way of forming the Village Common Fund is to make the collection in the shape of grain at the time of harvest. The raiyat will not feel the contribution as a burden. In many villages when measuring the new harvest heap of grain in the *Kana* the first measure is called "God's Measure" and is utilised for charitable purposes. It is also very common for mendicants of all sorts to collect themselves in the *Kana* when the new crop is being measured and taken home. The last few seers are invariably distributed among these mendicants. To make charity in the shape of grain at the time of harvest is an inborn habit with the raiyat and he will not grudge paying a small stipulated quantity of grain for the purpose of his village common fund. This will be moving in the line of least friction and in a way which would be agreeable to the raiyat. In the next place there will be no difficulty about collection since the illiterate Patel also might do this work easily and satisfactorily without waiting for any extraneous help. He knows the number of *Kulas* in his village and the stipulated quantity which each householder has to pay. There will be no leakages whatsoever, as the Patel who in this work should always be helped by the Village Improvement Committee, cannot possibly misuse the small quantity which he gets from each householder. In places where the Patel cannot be called a respectable man and is not in affluent

circumstances the most respectable and affluent man in the village might be selected to be the custodian of the common fund grain. The villagers will have the satisfaction of seeing their common fund in their own village in a perceptible form.

Ragi should be the grain to be collected as it is the crop which is universally grown throughout the State. In the rare villages where the wet area is far in excess of the dry area paddy might be substituted for ragi. But the total collection of paddy should be converted into ragi as the latter could be preserved without damage for a longer period. The quantity to be paid by each raiyat might be fixed at ten seers whose value in normal years is less than a rupee. In villages it is inadvisable to prescribe any sliding scale of payments according to the circumstances of each householder. The usual custom in the village for all communal purposes such as "Marihabba, etc.," is to assess equally every householder irrespective of his means. If the proposed scheme is to have a permanent foundation at all it should be based on this *mamool*. It is left to Economic workers and the local officers to appeal to the philanthropic side of the rich people to contribute more for the benefit of their own village. But the obligatory minimum payment for each householder, except for those living by wages, should be fixed at ten seers per annum. There might be a few recalcitrant elements here and there. But they could be overcome by judicious encouragement by the Sheikdars and enquiries by the Amildar during his tours.

It is very desirable that the Common Fund should be preserved in the shape of grain alone without being converted into cash. If the scheme is worked properly it will be found that in the course of some years the total stock of grain in the village in the shape of the Village Common Fund, would be equal to the total annual out-put of the village of that crop. Such permanent

stock of grain in the village might be able to mitigate the effects of famine even. Fifty per cent of the collections might be reserved as a famine fund. The balance might be lent out to needy raiyats of the village at a small rate of interest. The interest so earned would in a year or two enable the village to meet its annual communal expenditure for economic purposes, such as, contribution to the Taluk Progress and District Committees, subscription for newspapers and journals, etc. When the accumulations exceed the average annual out-put of the village, the surplus might be sold and the proceeds utilized for some permanent benefit of the village.

The number of agricultural householders in the Kolar District might roughly be taken to be 1,10,000. At the rate of ten seers for each householder the annual collection of the whole District for the Village Common Fund would reach the grand figure of 11,00,000 seers or a quantity almost equal to the total annual consumption of ragi in the Kolar Gold Fields.

The collection of the Village Common Fund in the shape of grain would facilitate the starting of Village Co-operative Grain Banks. Each taluk should be divided into a convenient number of units for purposes of starting Village Co-operative Grain Banks. Each unit will have a number of villages attached to it and the central village wherein the Bank is to be located, should be selected with due regard to the availability of competent men for working the Banks. The Village Common Fund grain of every village included in the unit might be kept in fixed deposit in the Bank in the name of the Patel subject to the condition that 50 per cent of such deposits should always be kept in reserve in the shape of grain. This procedure while supplying capital for the Bank, would ensure safety to the fund and augment it by means of the interest it would earn.

The scheme might be systematised and worked in the following manner:—

(a) Every ryot who owns ploughs and cultivates lands in the village shall pay ten seers of ragi annually. Non-ryots, such as, traders, artisans, etc., except coolies, should also contribute a similar quantity.

(b) Every village shall maintain a register with the following particulars:—

- (i) Serial Number,
- (ii) Name of ryot,
- (iii) Quantity and kind of grain,
- (iv) Date of payment, and
- (v) Remarks.

An ordinary good Exercise Book would do and it will last for a number of years even in the case of the biggest village. In the front page there should be a certificate as to the number of pages the register contains.

(c) The register shall be written up by the Shanbogue every year at the time of the Taluk Jamabandi and submitted to the Amildar for signature. It should be given to the Patel with the Taluk seal.

(d) The grain shall be collected at the time of harvest by the Patel with the help of the local Village Improvement Committee. The quantity so collected shall be kept in the custody of the Patel or other reliable person to be decided by the villagers. The total collection should be receipted in the register by the person who takes possession of the grain.

It is very essential that the collection should be made in the harvest season. Otherwise the ryots would find it difficult to subscribe, specially, when they are exhausting their stock.

(e) After the grain is collected from all the ryots in the village and the total collection is receipted as aforesaid, the Patel when he goes to the Taluk Office for remitting the *khist* amount, should submit the register to the Amildar for his perusal and signature.

The aforesaid method having assured a steady and assured annual income for the Village Common Fund, the collection of funds for the Taluk Progress Committees and the District Committee is rendered easy. Each Village Improvement Committee shall subscribe annually a sum of rupees two only, of which one rupee will be credited towards the funds of the Taluk Progress Committee and the other rupee towards the funds of the District Committee. In the case of big villages there will be a Village Improvement Committee for each village while in the case of small villages there will be one such Committee for a group of villages not exceeding six. It therefore follows that in the case of small villages the incidence of contribution will be very low. No Village Improvement Committee can therefore grudge paying an annual subscription of rupees two only, especially as has been pointed out that this expenditure could be met out of the interest earned annually on the lending out of the Village Common Fund.

In the Kolar District there are at present 2,500 Village Improvement Committees. If each Committee pays annually the small sum of rupees two, the District Committee will get an annual income of Rs. 2,500 and the eleven Taluk Progress Committees a like sum. This steady and assured annual income might be supplemented by other contributions and subscriptions from members. Most of the Taluk Progress Committees at present have not been able to collect annually a sum of Rs. 100 and earn the Government grant of Rs. 100. The arrangement now proposed assures each of the Taluk Progress Committees the annual Government grant of Rs. 100. The District Committee cannot rightly expect any contribution from Government as it is already paying the travelling allowances of the members and an annual contingent of about Rs. 400 besides the pay of the establishment and the allowance to the Secretary.

A NOTE ON THE IMPROVEMENT OF MYSORE CATTLE.

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MYSORE is essentially an agricultural country. Eighty-six per cent of the population depend upon agriculture for their living, and the maintenance and rearing of cattle forms naturally a very important subject for consideration.

This subject may be classified under three heads:—

- (a) Cattle breeding,
- (b) Cattle feeding, and
- (c) Preventive and curative measures against mortality of cattle from diseases.

CATTLE BREEDING.

Mysore cattle were once very famous for their power and endurance and their capacity for hard work. The Amrit Mahal breed of cattle still maintain their fame for swiftness and are largely used for military transport work. The breed and selling of bullocks is a paying industry in the Mysore and Hassan districts. But there has not been any serious organized attempt made on any appreciable scale to develop this useful and paying industry.

Any excellence with regard to cattle is, however, confined only to bullocks. The breeding of milch cows, the importation of good breeds of such cows, and the systematic development of dairy-farming are all matters in which no progress has been made worth mentioning, and there remains still very great effort to be made in these directions. This work may with advantage be entrusted to the Veterinary Department.

A Central Association of cattle breeders in the State should at once be formed in district head-quarters at Mysore and Hassan,

the Director of Agriculture and the Superintendent, Civil Veterinary Department, being obligatory members. Census should be taken of the number of cattle breeders, the number of cattle in the State under each class of the recognized breeds such as Amrit Mahal, Hallikar, Gujjamavu, Bettadapura, Nadudana, etc. Watch should be kept over the number of cattle sold every year and the prices realized, and care should be taken not to indiscriminately sell the existing stock without proper safeguards for increasing it. Central Farms for cattle breeding and cattle rearing should be started in each district head-quarters to serve as (a) depôts for people desirous of bringing improved breeds of cattle, and (b) models for similar farms to be started in interior stations.

An annual show for the whole State should be organized preferably in Mysore, where all the best breeds of cattle should be represented, the exhibits being both from Government Farms and from among cattle belonging to private owners. More than all even legislation, if necessary, would have to be resorted to, for preventing inferior cattle from spoiling the breed of good cattle.

Cattle feeding is another prominent factor with regard to cattle. The present arrangement of herding together all the cattle of the village and allowing them to graze on the village *gomal* or in the jungle is attended with very pernicious results. In fact there is no cattle-feeding at all done in respect of these cattle. Stall-feeding is very rarely resorted to and that too in exceptional cases. There are no special efforts put forth to effectively supplement the gleanings the cattle get from the village green. In most cases there will not even be green *gomals*; but bleak hill tops and impossible fallow fields with absolutely no vegetation form the feeding ground for these dumb creatures. There is thus very little wonder that cattle in most villages are out of condition.

RECOMMENDATIONS.

(1) Special crops for feeding cattle should be advised to the ryot by means of lectures and printed leaflets.

(2) In District Farms such crops should be raised and cattle fed on same, showing thus practically the benefits derivable therefrom.

(3) Special prizes should be offered to ryots growing fodder for cattle and even to stall-fed cattle.

(4) Arrangements should be made for supplying to the people through the several Agricultural Associations artificial feed for cattle.

(5) Depôts for the sale of such feeding stuff should be opened in each district head-quarter.

PREVENTIVE AND CURATIVE MEASURES

This is a very important matter. Thousands upon thousands of cattle are dying every year owing to the outbreak and spread of preventable diseases. Rinderpest, blackquarter and other diseases have been rather of too common but very sad occurrence. The existing veterinary staff is too inadequate to cope with the situation. One stationary Inspector for a taluk may not be able at all to attend at all places where there may be outbreaks simultaneously.

A mobile corps of Veterinary Inspectors with necessary equipment and paraphernalia would be necessary for each district even after establishing a Dispensary in each taluk. Popular opinion is very much in favour of veterinary aid being secured as early as practicable. People are even willing to tax themselves and thereby find the necessary funds to meet the cost of these dispensaries. Remarkable instances of real enthusiasm and an honest endeavour to ameliorate the condition of their cattle by means of timely veterinary aid, were afforded at the last year's conference, when practically every taluk, in the Shimoga District

was willing to tax itself if necessary, provided only the Government sanctioned one Veterinary Dispensary at least for each taluk. This shows that popular prejudice, if any existed, has begun to wear out, and a beginning may be straight made at least in those taluks, in which the people have thus signified their willingness to co-operate with the Government.

The necessary cost of equipment including medicines may be left to be borne by the people, the pay proper of the staff and even their travelling allowances being borne by Government.

Popular lectures and demonstrations with regard to the more frequent diseases of cattle and their cure could also be arranged to be conducted by a mobile corps for each district. The staff of this corps should be available for such work whenever there is not any special call for attending serious outbreak of epidemic.

An appeal to the natural feeling of veneration which the Hindu cherishes to the cow and for that matter to cattle in general will never fail to be responded, and even the least effort on the part of the lecturers will be amply rewarded by ryots and influential non-official agencies coming forward to co-operate with Government for establishing fresh dispensaries. Gorakshana Sabhas are voluntary organizations in Bombay and such like important Indian cities. Practically every shop in Bombay has a dole-box of the Gorakshana Sabha for the customers to contribute their mite. And even in our own State, it should be easy to find voluntary agents to take up this work, of supplementing the Government's activities by finding extra funds either to stall a large number of such cattle or to amplify the resources of any particularly popular and useful dispensary.

An argument is put forth that the existing dispensaries are not sufficiently popular inasmuch as in many cases the average

daily attendance is not large. But this statement loses all its force when it is considered that many a villager does not know even the very existence of a Veterinary Dispensary in his midst, and that the usefulness of these dispensaries will only be apparent on the following conditions:—

- (1) Wide publicity should be given to the fact that such dispensaries exist in specified places, that these dispensaries work during specific hours and that the treatment is gratis.
- (2) Each village Chavadi should contain a printed notice to this effect, and
- (3) Each dispensary should be in charge of two Assistant Inspectors, one whom will be itinerating within a radius of eight to ten miles while the other will attend to cases at head-quarters.

In short, the willingness for the ryot to co-operate with Government, in affording veterinary aid to cattle exists, and will continue to do so, as long as the Hindu has any reverence for the cow and its species.

The main thing that is required to be done is to go to the ryot and tell him what is required of him even if it be in the shape of contribution towards the cost of any dispensaries or hospitals for cattle. More men with adequate knowledge and sympathies for the Mysore ryot, more dispensaries, more hospitals, and above all, wider publicity among the people of the fact that veterinary aid is available, these appear to be the main ingredients for securing popular co-operation and even active participation in the efforts of the Veterinary Department.

FAILURES OF DAIRYING.

By M. AMINUDDIN ALI.

MILK is a highly complex fluid, beautifully designed by Nature to nourish the offspring of mammals that produce it. This boon of Nature has the disadvantage that milk as milk has very short life. Man has not only found out uses of milk for himself but has overcome the disadvantage by converting milk into products of longer life and concentrated form capable of leisurely use and easy transport. This conversion is done in two ways, *viz.*, by machinery, into cream (for butter-making) and skimmed milk; and by hand into butter (for ghee-making) and curds. Butter and ghee which form a small percentage of milk, have long life and are the products aimed at. Skimmed milk and curds, which form the bulk, have short life and are waste products as it were. They are also consumed by man, but they should be consumed without loss of much time. Owing to their bulk, cheap value and short life, they are incapable of bearing cost and time of transit and hence should be consumed in or near the place of production. Milk produced in or near populous centres is consumed in one form or other by human beings to the advantage of the milk-producer. Where milk is produced in rural parts farther from populous centres, which is the bulk of milk-producing area generally, there is no demand for local consumption of milk and its superior products, hence the milk producer converts his milk into long life products for export and gets its value, the waste products yielding nothing to him. The problem of ryot's welfare resolves itself into this form, "The milk-producing ryot will be benefited to the extent to which the waste products of milk in rural parts can be converted into money."

Between Dr. Lamuel Joshi's "Milk Problem in India"—a very comprehensive book on the subject—and Bulletin No. 9 of the Department of Agriculture of Mysore State—a mere pamphlet—there are several books but none dealing with the solution of this problem. Science has disclosed the existence of *Casein* in skimmed milk, but no such advantageously workable thing in curds. Extraction of *Casein*—which exists in milk in very small portion—is a very recent discovery, information on the subject in the Press is very rare, and processes are almost impenetrable trade secrets protected by patents.* Advantage to the ryot in the line of milk lies in this quarter only. Neither the ryot has taken this advantage nor any body else has given it to him yet.

Last year circumstances forced me to seek a new field of activity and I hit upon Dairy business for the reason among others, that there exists in it much scope for philanthropy—a passion that instinctively outweighs considerations of self-aggrandisement at later stage of one's life. I learnt dairying, secured the outfit to start business on a modest scale, and succeeded in extracting commercial casein. In the middle of December last I deposited myself with all my plant and tool at Kilanpura, a roadside village, twelve miles from Mysore on Mysore-T. Narsipur Road. I then collected definite statistics of milk-yield within a radius of easy reach and timely transport to this centre, ascertained the selling rate of milk and its products at different seasons of the year, tested butter and casein yield, fixed a price for the milk, reserving a small margin to cover working charges and profit and a big one for the ryot, and offered to take milk for cash or against reasonable advances. I believed every thing would be smooth for me from here but my efforts came soon to a full stop.

The factors that came in the way to defeat my object may be classed under the following four heads for separate treatment to

give a clear idea to a reader not having personal experience of conditions of life in rural areas :—

- (a) Absolute ignorance, wretched contentedness, or ruinous conservatism—whatever name the educated may choose to give to the quality inherent in the ryot.
- (b) The influence of the housewife over the husband in matters pertaining to milk and the causes of reservation of her rights.
- (c) The interest of the butter collecting itinerant agent and his indispensable services.
- (d) The inborn nature of the local oracle, the Yejman of the village, his influence and methods.

The Ryot.—One seer by measure of buffalo's milk yields about a quarter seer by weight of butter. This average exceeds by a small percentage in rare cases, where the animal is given special ration. This fact is established by researches of Science experts and recorded by tests made by the Agricultural Department in the State. The ryot has never in his lifetime measured the milk and weighed the butter extracted from that, for fear of animal drying or dying soon after such test, as in many instances related to him by his grandmother. The buffalo, his wife's pet and hence his pride, gives milk that yields seer to seer butter, and nothing can dissuade him from this belief. He sells butter at four seers per rupee and this quantity he makes out of sixteen seers of milk, but if asked to sell milk, any lesser quantity than sixteen seers per rupee and thus save time and trouble to churnwoman and make profit, he refuses. He knows that milk sells dearer in cities but is incapable of imagining why it sells so and why he could not compete there and earn. With this knowledge as basis to fix price, he offers half a seer over and above city rate and nothing more. No argument or reasoning can push the matter further. If the dairyman sticks on any

longer with all the tact and patience in him the ryot gets reinforcements of housewife, the yejman and butter agent in the meanwhile. The argument that did not work upon one man, the ryot, could not convince him plus his three allies, to whose interest a bargain is adverse. The dairyman gets no hearing in the blabber of several voices and is forced to quite tired of the affair. After that, the matter is discussed by groups on pials and under trees as the burning question of the day. The dairyman goes to the village next day, vainly hoping that the ryots might have returned to reason after thinking over the matter coolly, but instead there is an infection and a scare. No inducement of fair dealing, profit making, cash payment, advance payment, salvation from the follies of the housewife, from the rapacity of the agent and from the clutches of the *yejman* make the ryot to approach the dairyman with feeling of goodwill and trust. The housewife is unapproachable, the agent is in advance to warn the villagers of a demon's arrival and the yejman is there to paint the devil in pitch and tar. The dairyman has to try his luck in some other village to meet the same fate.

Housewife.—Any woman in the family—whether wife, sister, daughter-in-law—living in the house permanently and in charge of milch-cattle and milking operations is to be understood by this name. The Press and pulpit add the adjective hard worked to the name ryot. If the period of hard work is to be the criterion for the award, it may be rightly said that the qualification is shifted from the arms of the housewife and placed on the shoulder of the ryot. It is the wife that toils all round the year from before sunrise to after sunset all through, whereas the husband works only during cultivation season, which is a mere portion of the year, and the rest of the time spending on pials or elsewhere talking, moping or sleeping. The husband earns the bread for all by his labour during the cultivation season and the wife

looks after herself, her husband, the rest of the family and cattle stock at home all round the year. The husband does not give her any pin-money, perhaps he has taken a vow for it. She has to earn it. What she earns openly, she has to give away to her husband. She is therefore forced to earn without her husband's knowledge if she has to earn for herself. She is far from earning by infamous methods. These circumstances force a new code of morality on her, and in her ethics she is morally convinced that when she sells four seers of butter on family account, she has a right to sell a little "quarter seer" or so, on her own account, to enable her to purchase a bodice, like one worn by Kempri, when she goes to Mysore next *Navaratri*. My Lord, in honor bound, in exchange for relief of labour, has handed over to my Lady, the milk Department in toto, except the right to receive the sale proceeds of butter offered by her and my Lady has cheerfully taken charge with reserved right of pin-money, known to both parties but not admitted by either. Invariably the butter-agent has his transactions with the wife behind the back of the husband and if by chance the latter should happen to be present it is by implied mutual consent to be his corporeal body and not the conscious body. The shrewd agent seeks such opportunity to serve his purpose, and the foolish housewife too seeks it for the like purpose, whereas it is the thoughtless ryot that is the victim in the long run. Thus hedged in the husband bows his head to the mandate of his merry wife, that her buffalo yields milk that gives seer to seer butter, that selling milk as milk is ruinous, that if milk is sold away the children will die for lack of curds in the dietary and so on. The husband believes in such gospel truths, acts on them and refuses to sell milk to Dairyman.

The Butter Agent.—When no more than four seers of butter per rupee is to be had in villages, it sells in the city at three and

three-fourths seers though Octroi duty, transport charge, agent's labour value, work up far beyond the margin of one-fourth seer. Butter holds water and is not capable of adulteration as much as ghee. In spite of all these disadvantages, with such slight difference in buying and selling prices, where is the margin of profit and how do city ghee merchants become Sowcars soon, though the agent can afford to lose something in gambling in the village? The clue is not far to seek. The scales, the weights, the advance rates, the accounts in memory, the mental calculations, the price of exchange articles, the transactions between a pedlar and a home-struck woman, all these circumstances contribute to sacrifices of the ryot through his pennywise and pound-foolish wife and go to make butter sell in cities with slight difference. The scales in the hands of the agent, does such wonders as the wand in the hands of the magician does in sleight-of-hand tricks. The weights—two smooth rounded stones found in river beds, called half seer and quarter seer weights—are of the standard of agent's honesty and even a large quantity of butter is to be weighed with these small weights several times. The purchase rate has the very small margin of 25 per cent per mensem to cover loss of interest on advance amount. Some may not believe the above figure of 25 per cent per mensem, but the difference of quarter seer per rupee against advance for a week, the turn over works up to four annas per rupee per mensem by simple rules of arithmetic all know. In many instances he does not pay the advance in cash, but in cotton seed and husk powder. He retails big cotton seed at small seed price, adding transport charges and the so-called little profit, which if it should even be cent per cent, the villager has no means of finding out. He buys husk powder from rice mills, takes away all the minced rice out of it and retails the powder with additions as on cotton seed. A

balance of two seers and three paos at the close of one transaction opens the ledger in memory with three seers and two paos at the next transaction after a week. Formulae for mental calculation of value of butter weighed are also of the same type. If the housewife differs from the agent on any point, there is dread of harm, who knows what, she is alone, and apart from that, how to dispose of the butter on hand and get cotton seed and husk powder for the week.

The Yejman.—He is also the self-imposed head of the faction invariably in existence in every village. You approach him and it is only then that he takes you to the biggest pial of the biggest house which you will afterwards learn to be of some body else. He speaks of his constructive authority and destructive insubordination of his flock, copious yield of milk and great demand for local consumption, his honesty and ryots' tricks, his wisdom and their ignorance, in fine, a paradise in one palm and a hell in the other. Simultaneously he pumps you out. He also forces you to believe that if you go through him all the milk in the village is yours for the asking. You push him to point of business but he grows solicitous of your dinner hour, escorts you alone to some distance and there does the real business of enjoining upon you the absolute necessity of doing nothing with the ryots yourself direct. He accepts rates and enters into contract on behalf of the village. You return home satisfied. Some milk comes next day and the carrier brings word to send money with him for advances. You find the milk very thick and rich in cream and half a seer more than what the carrier said. You go over next day with money. Yejman is very busy and could not sit down, so imparts to you standing that he has engaged a young man (his son) to keep accounts, an old man (his father) to carry milk, an upright man (his brother-in-law) to collect and test milk; that he has spoken to all the ryots, ninty-nine parts are

already won and money will make the hundredth. You drop the money into his hands and he immediately confers upon you the title of Sowcar, out of the list of his kitten's birthday honors. Just then he remembers that he has to go to his Guru, the interview closes and you return home. Milk comes late and measures half a seer less. You send word. Next day, in addition to previous day's defects milk is diluted and you send word but no reply; you yourself go but *yejman* has gone to some village. You go again and again and catch him one day and begin to enumerate the shortcomings but before your list of complaints is exhausted, he cries you out of order and reminds you thus: "Did I not tell you in the beginning alone, that the people in this cursed village are insubordinate, unreasonable, etc., etc., and what not? We have to bring them round gradually and with tact. City methods will not succeed here. The worst of it is that the ryots have taken into their heads that you will not stay here permanently. There is a land for mortgage, free from any the least trouble (afterwards you learn that it is *yejman's* own, with three prior mortgages, ancestral property of an undivided family consisting of minors) a very good bargain, many want to go in for it, but I can arrange it for you." You feel bored and refuse the offer and at once you are deposed from the Sowcar's pedestal. You are gratuitously advertised by *yejman* as an insolvent black sheep from the city, come to plunder the village, that dairy business is the thin end of the wedge to introduce tax on milch cattle and milk products and (in a low voice) to collect recruits for war and other purposes. Implied challenges ripen into direct and open ones. You press him to settle accounts and he cries out "Am I a rogue? Have I eaten away your money? All is advanced; find it out from parties yourself; recover it from them in milk; I am not expected to remember all that and to recover from them." You have lost in lump and each ryot has lost something. The villagers

are under the impression that they have supplied you with milk but you have not paid for it as said by *yejman*, and you are under the impression that your money is with the ryots. This attitude between yourself on the one side and the ryots and their head on the other, forces you not to enter into the village again. You leave it for good with an *adda*, pots, measure, and pales in addition to money.

The Socialist cries out that the lot of the masses should be ameliorated; another lectures that village system should be organized; and still another preaches that the masses should be educated; the co-operator harangues that co-operation must be introduced. Kaundinya advocates that improved methods of agriculture should be universally demonstrated; the milk expert publishes that cattle breed must be improved and the State wishes that ryot should grow prosperous and happy. I am neither an apologist nor an antagonist of these sermons and wishes. From the standpoint of the limited sphere of my activities, I would say, let the lot of the ryot be ameliorated item by item, step by step, and spot by spot. The Agricultural Department commends the starting of co-operative diaries throughout the State. When the ryot is incapable of realising the advantage of selling twelve seers of milk per rupee instead of labouring with sixteen seers to earn that rupee, his intelligence has to cross black waters to grasp the idea of co-operation. The same Department has also recorded its experience that in diaries owned by enterprising individuals "the ryot usually has the upper hand in the transaction and cases are known where ryots have refused to sell milk at rates which will leave a margin of profit to the buyer who has consequently had to shut down and move the separator to more favourable localities" The whole passage must have recurring decimal marks along with inverted commas, for repetition in case of every diary without exception, since the enterprising

individual has to move the separator from one more favourable locality to another—and there is no end of such localities—localities where the ryot learns that very next day after your settlement, how to have the upper hand in the transaction. The interest of one enterprising individual is in no way less than the aggregate interest of several ryots. Instances of failure of dairying are more than those of its success. This statement does not count Government Dairies worked to meet the demand of Troops at any cost and such other Dairies worked by organizations to meet the demand of the public at any sacrifice of dividend. Co-operative Dairies by conservative and ignorant ryots will never see the face of the sun unless and until dairies started by enterprising individuals should force their existence and advantage upon the dull attention of ryots. No enterprising individual, however persevering, self-sacrificing and philanthropic he may be, will sustain his enthusiasm and work longer than possible limits of his stock of funds, energy and prospects.

In the light of all the above stated facts, the remedy is to come from official quarters. Dr. Joshi has gone to the extent of emphasizing the necessity of the intervention of the legislature to solve the milk problem, but where the problem of ryots' welfare can also be solved along with it, the intervention of official influence becomes imperative when nervous patients among the educated prefer to suffer excruciating pain from an abscess to having immediate relief by a surgeon's lancet, it is too much to expect the callous ryot to come forward to ameliorate his condition at his own instance. The ryot as a rule distrusts a stranger, however good the latter's intentions may be, and takes at a discount every new scheme, however beneficial to him it may be. If he has any faith, he has it in the *Sircar*. The authorities must, therefore, come forward, determine the margin of profit to the dairyman and to the milk supplying ryots, fix rates on that basis, bind either

side for the due performance of mutual obligations and safeguard the interests of both sides. The efforts of authorities must not be half-hearted and spasmodic but of the one-thing-at-a-time and-that-done-well nature. Necessary exercise of official intervention, influence and control within permissible limits will not only help the achievement of the object aimed at but will also remove the harms of the unscrupulous agent and *yejman*. When once the experiment succeeds there will be no lack of dairies by enterprising individuals and in their train dairies by co-operation of appreciating masses. There are villages situated so far from cities that milk or curds cannot be transported for advantageous sale. In such villages the milk producer makes rupee out of butter from a certain quantity of milk say twelve seers. To him selling ten seers a rupee is a gain both in money and in saving of labour. No dairyman can work profitably even buying milk at this rate in rural parts where skimmed milk or curds cannot be disposed of unless he knows to convert skimmed milk into casein. The larger the quantity of milk supplied to the Dairy, the cheaper the cost of collection and working into cream and casein. The regularity and punctuality of supply help the dairy work to a great extent. Disproportionate advances to the ryot give him the upper hand to practise unfair means. Such advances in the hands of the middlemen are worse for all sides. Weekly payment after supply, even for a quantity of 600 seers *per diem*, does not come up to a sum difficult of recovery from the dairyman but the same amount advanced to hundred ryots is not only difficult but tedious of recovery. Responsible and scrupulous members in each village should be chosen and nominated by the authorities to hold the scales between the dairyman and the ryots; of course, the labour of such members being gratuitous on the side of the community and carrying an honorarium on the side of the dairyman. The conduct of the ryots, the middlemen and the dairyman must be under check and control of the authorities, *i. e.*, Shanbhogue and Patel checking over ryots, Shekdar over members acting as middlemen and Amildar over Dairyman.

ECONOMICS IN THE WEST.

India's Industrial Development.

London, September 19, 1918.—Sir Ratan Tata's lamented death has brought to a close a useful life which could be ill spared at the present stage in India's industrial development. Like his father he was a man of exceptional resource, was inspired by high ideals and steadily pursued the aim he held through life of promoting the commercial greatness of his native land. Such leaders are rare in any country and they are especially rare in India where the bonds of an ancient system and of an immemorial Conservatism impede progress as the term is understood in the West. Happily his example survives to stimulate the ardour of the young Indian mind now burning with zeal to give India its rightful place amongst the industrial nations of the globe.

More than ever industrial advancement is the keynote of the aspirations of the Indian patriot. It was sounded in no uncertain way in a statement which Sir S. P. Sinha made at a Conference of Overseas Press representatives a few days ago. His postulate was that India is a poor country and that its loyalty to the Imperial connection is bound up in making it prosperous. A good many perhaps will be disposed to join issue with the Indian Member of the Imperial War Cabinet on his argument that "without increased prosperity it was useless to expect India to be either contented or loyal to the connection with the Empire." Prosperity is a relative term and it may be that the Indian ryot with his modest needs and his freedom from the harassing strain of life in the advanced communities in the West will be found more contented with his lot than the wage earners of other parts of the Empire whose material position is infinitely more advantageous. If modern history shows anything, it shows that contentment

and high pay do not always go together. For example, at the present time, the working classes here are enjoying a spell of unexampled prosperity; yet there has not for a long time past been a greater under current of unrest. Still Sir S. P. Sinha is undoubtedly right in insisting on greater attention being paid to material progress in India than in the past. The *laissez faire* methods which he condemns have kept India in industrial leading strings and we need to abandon them in favour of a policy more in harmony with the spirit of the age. The great natural wealth of India must be developed on modern lines and the Government must take a prominent part in the work. As every student of Anglo-Indian history knows, and as I have before shown in these pages, this will mean no new departure but rather a reversion to the old conception of the stimulation of industry by official action and experiment on scientific lines in suitable directions. As the tin industry was created directly by Government initiative so may other equally valuable new industries be brought into life if proper use is made of opportunities and of the powerful resources which the authorities have at their command. When the Industrial Commission's report is forthcoming we may confidently expect that it will have something practical to propose on this subject.

NEW PAPER MAKING MATERIAL.

The search for new paper making material is taking our experimentalists into some unaccustomed byeways. Recently the Imperial Institute has been making a series of researches into the properties of various grasses from South Africa, the Federated Malay States, Australia and St. Helena. Samples of "tambookie" and similar grasses from Pretoria gave a high yield of pulp of good quality capable of conversion either into excellent brown paper or (after bleaching) into white paper. But perhaps the most promising material under examination was *lalang* grass from the Malay States. *Lalang*

grows abundantly in Malaya and is regarded by planters very much as a noxious weed owing to its persistence in the rubber plantations in spite of measures adopted for its extirpation. Yet it is found to compare very favourably as a paper making material with esparto grass from Algeria though it does not come up quite to the standard of Spanish esparto. Bamboo grass from the northern territory of South Australia also yielded good results. In short, the series of experiments clearly demonstrated that there is an encouraging opening for the profitable utilisation of many luxuriant growths in the remoter parts of the Empire—growths which hitherto have been of little or no commercial value. In this matter India ought to be able to take a good share of the profits which may result from the widening of the paper makers' search for fresh raw material. At all events if Australian bamboo grass can make a showing in the new picture, the Indian product of the same type cannot be far away.

THE RUBBER OIL.

For a considerable time past experiments have been proceeding in the Federated Malay States with a view to the discovery of a process by which the seed of the rubber tree may be made available for commercial purposes much as cotton seed is. According to the latest reports entire success has attended the efforts of the British Malayan officials. From the seed an oil has been produced of such a high grade as to require little refining while the residual cake is of value as a food for cattle. An experimental consignment of 30 tons of seeds sent to England resulted in £50 per ton being obtained for the oil while £8 per ton was realised for the cake. As the £50 per ton for the rubber oil contrasted with £60 per ton secured in the market at the time for linseed oil, the price may be regarded as very satisfactory. The expectation is that in the not distant future rubber oil will occupy a place but little inferior to linseed oil and if this should prove to be the case quite a new aspect will be given to rubber cultivation. In any event the demonstration that a saleable oil can be readily extracted from rubber seed is of much value. At present the seed is a mere waste product.

It is obtainable in great quantities and can be readily collected. The rubber oil will be the more acceptable just now as rubber itself is under a temporary cloud owing to the congestion of supplies and the consequent deterioration of values. The fact that apart from rubber the industry has great possibilities will help to stimulate the weak and strengthen the strong in the conviction that the plantation rubber interest has a great future before it in spite of present appearances to the contrary.

EMPIRE SHOP WINDOWS.

A few days ago an interesting article appeared in the *Morning Post* under the title of "Empire Shop Windows." It dealt with the window displays by the great Dominions and Colonies of their peculiar products. How enormously interesting these are was the theme of the writer and he pleasantly illustrated his remarks by some apt allusions to the historical import of the displays. Reading the article I was reminded, as I have often been reminded before, that amongst the great members of the Imperial family India is the only one that is unrepresented in these "Empire Shop Windows." There may be some sound reason for the omission, but I am afraid that the explanation is that official aloofness from the realities of life and especially of commercial life which has been only too painfully revealed in the history of the war. Actually the Government of India is as much interested in promoting the material interests of India as Canada is in helping the industries of the Dominion. And if it pays Canada to subsidise a shop window and if it is not *infra dig* for her Government to advertise her wares, surely it would be equally profitable to India and in no greater degree derogatory to her Government to do so. "Sweet are the uses of advertisement." We have abundantly discovered that in the course of the war, and the lesson thus acquired will not be lost. Whether some of us like it or not the day is coming when all governments will advertise as a matter of course like any great commercial undertaking that has to court the favour of the public. The shop window with characteristic samples may, indeed, be quite a mild form of making the appeal to the public eye which will ultimately be adopted.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Electricity Hazards.

Washington, D.C., U.S.A., October 12, 1918.—One of the interesting problems that the experts of the United States Bureau of Standards are working out is a study of the life hazard in electrical practice and in the preparation of the national electrical safety code. In this work the bureau experts have had the co-operation and assistance of a large number of engineers, many of whom are connected with the electrical operating and manufacturing companies, others being engineers and inspectors of state commissions and municipalities.

The importance of having a national code uniform in all the states is realized by those who are making the study of the situation to be quite as great for accident-prevention rules as for fire-prevention rules, and the advantage of having such a code prepared and presented by a national agency that can study the subject thoroughly and consult all the interests affected is very obvious.

The safety code consists of four principal parts: 1. Rules for the installation and maintenance of machinery switchboards and wire in central stations and sub-stations; 2. Rules for the construction and maintenance of overhead and underground lines for the transmission and distribution of electrical energy and intelligence; 3. Rules for the installation and maintenance of electrical apparatus and wiring in factories, residences and wherever electricity is utilized for light, heat or power; 4. Rules to be observed by employees in working on or near electrical machines or lines.

The code is intended to be adopted by state industrial and public service commissions and municipalities and to be complied with by all public service and industrial corporations. It is also intended to be

adopted voluntarily by electrical interests when the code has not been adopted by any administrative body having jurisdiction in their district.

SAVING BILLIONS FROM SMOKE.

America sends billions "up in smoke" yearly because of the enormous waste in the fuel used by our industries. On the other hand, there is a man in Washington who has discovered how to turn smoke into money, and he is now busily engaged in teaching the rest of the country how to perform the same trick. He does this by means of devices which, through electrical precipitation, not only reclaim vast wealth from the smoke, dust and fumes of smelters and other plants, but at the same time redeem thousands of acres of nearby land. As a matter of fact, the curb which he has put upon the smoke and dust nuisance—his original aim—now actually bids fair to be, in some directions, the primary reason for the running of certain of our industries. The smoke wizard who has accomplished these remarkable things is Dr. Frederic Cottrell, chief metallurgist of the U.S. Bureau of Mines.

Dr. Cottrell's experiments began several years ago when, as a member of the staff of the University of California, he was called upon to solve the problem of helping a smelter located on San Francisco Bay. The waste gases and vapors from this smelter, resulting from the sulphuric acid parting process used in treating gold and silver bullion, were declared a nuisance by neighboring farmers and seemed likely to provoke costly litigation and possibly lead to a shutdown of the plant.

The gases discharged into the air amounted to substantially 5,000 cubic feet per minute and held in suspension an important proportion of sulphuric acid in the form of a fine mist. The corrosive action of the acid, swept broadcast by the shifting winds, was felt throughout the entire zone and both the agriculturists and the people

generally had ample reason for complaint. The smelter was a profitable one and the management was anxious to find some way to abate a nuisance that was both a menace to health and hurtful to vegetation.

Dr. Cottrell's preliminary work brought up some puzzling situations. Up to a certain stage matters went well enough on the miniature scale of the investigational tests, but beyond this was the question of meeting the practical situation presented by a large commercial smelter. A big part of Dr. Cottrell's achievement lay in spanning the gap between the laboratory and the industrial plant and in finding ways to control the enormous pressure of the necessary electric current, mounting up to 100,000 volts.

The problem was solved, however, and so well was the precipitator installed at this smelter designed that it has been doing its work satisfactorily ever since. Further, by mere chance, Dr. Cottrell attacked at that plant what is commonly admitted to be the most difficult of all problems of fume or smoke abatement: the precipitation of acid mist.

The good results obtained in this first instance soon became widely known and a new line of application was opened a few years later when a great California copper smelter was threatened with litigation by the United States forestry service. Fume, or fine particles, in the form of smoke, and sulphur dioxide gas, invisible to the eye, given off from the stacks of the smelter, had swept the neighboring country bare of vegetation for miles, and it was a case of either a shutdown or a suppression of these destructive discharges. A full-size plant of the Cottrell type was, accordingly, installed. The volume of the gases treated averaged between 200,000 and 300,000 cubic feet per minute, and during the filtration tests made throughout a period of nine months it was found that the electrical precipitator recovered between 80 and 90 per cent of the suspended matter. With

some improvements in detail of construction the efficiency later was raised well up into the nineties.

The general public has only the faintest notion of the wastage represented in the fumes and smokes from belching stacks, quite apart from the beneficent economies following from the abatement of outpourings harmful to both man and vegetation. In the smelting of lead the fume contains anywhere from 3 to 10 per cent of the volatilized metal in the form of lead oxide and lead sulphide, with compounds of arsenic and antimony. This percentage is well worth recovering. Dr. Cottrell is authority for the statement that during the smelting and refining of various ores not less than thirty-six valuable substances are found in fumes which, if not collected, would be lost.

AN ELECTRICAL ENGRAVER.

An engraving device which operates by electricity is now being marketed by an American firm, which reports quite a considerable demand. This engraving outfit makes use of two available range transformers enclosed in an oak case. The main set of wires leads to the copper electrode which does the engraving; a second set leads to a manually controlled switch, located near the point of the pencil. In using this device the forefinger rests upon this switch, the switch remaining open while the writing or engraving is going on. When the operator wants to raise the pencil from the work he presses the switch with his finger and breaks the current to prevent flashing or arcing. The second set of wires which is controlled by the small connecting switch on the pencil runs back through the instrument board into the interior of the device. On one side dry cells are interposed to give a direct current for operating a circuit breaker fastened to the side of the cabinet. Writing with this device, say the makers, is as easy as writing in the usual way on paper with a pencil.

UNIQUE MEANS FOR REMOVAL OF COTTON BALE.

There are 125 storage compartments in the great public cotton warehouse in New Orleans, La. Each is about 100 feet long, and each holds 1,600 bales of cotton. These bales are piled 10 and 20 high, and the entire warehouse has a storage capacity of 200,000 bales. Yet every bale keeps its identity intact from the moment it arrives until it leaves the warehouse for shipment, and any single bale may be located at any time, in any part of the warehouse, within three minutes. And within another three minutes that same bale may be "rooted" out from a 20-high stack of bales without even disturbing the other bales in its vicinity.

This is done by means of an ingenious machine called a "bale puller," built in 1915 especially for use in the New Orleans warehouse. The "bale puller" is made of steel. It has an A-frame and a heavy cross beam of steel, to the ends of which are attached great iron hooks. At the centre of the beam is a cable with a breaking strain of about fourteen tons. Another cable joins the entire bale puller to the traveling crane overhead. When the signal is given to "root" for a bale the machine is forced up against the pile of cotton and the two great hooks are thrust into the pile, reaching to the very back of the bale to be removed. This is easy, as cotton is piled like bricks in an arch, with the bale above over a wide crevice at the side of the bale below.

The craneman presses a lever, there is a pull on the cable of varying weight, as much as 4,000 pounds sometimes being required to remove a bale, the cross beam pulls out the two great hooks, and the bale falls from its place, leaving the rest of the pile intact. Rooting for a bale by means of the bale puller requires three minutes of time and two workers, the craneman and the groundman, as against a half hour of time and five men to do the work by hand.

The New Orleans public cotton warehouse is the only one in the world equipped with this ingenious machine.

EARTHQUAKE IN A MINE.

Persons who have been in mines during earthquakes of more or less pronounced intensity at the surface have recorded quite different experiences, some claiming that the shocks were imperceptible in the mine, and others stating that they were quite plainly felt. Probably the conditions actually differ a good deal with differences in rock structure, the neighboring rocks in one case transmitting the vibrations readily and in the other absorbing and deadening them.

In the "Bulletin" of the Seismological Society of America, Mr. W. F. Staunton, a widely known mining engineer, describes his own observations in a mine at Tombstone, Arizona, in the summer of 1915, during a widespread earthquake which, at the surface, caused plaster to fall, threw down chimneys and disarranged foundations. He says that at the time of the shock he was in a large inclined open stope about 150 feet below the surface of the ground. The first warning was a heavy roaring noise, followed almost immediately by the beginning of vibration, which continued for several minutes and seemed to culminate in a very pronounced jolt. Loosened rocks from the hanging wall crashed down, and there was much commotion.

In a neighboring mine the shock was felt at a depth of over 500 feet. A man standing in a drift in hard white limestone felt himself impelled to brace himself against the wall to maintain his equilibrium, and distinctly saw—and this is a very remarkable statement—a wave or deflection in the solid rock approach and pass him.

Mr. Staunton concludes, however, that while earthquake vibrations may be felt at depths of several hundreds of feet they are probably not a serious source of danger in

mines. Probably, as suggested by a well known seismologist, earthquake waves are of relatively small amplitude at great depths on account of the great weight of the overlying rock. It may be added, too, that a special type of earthquake appears to be caused by mining operations and seismographs have been installed in certain mines in Belgium and elsewhere for the purpose of studying the phenomenon.

MAKING RADIUM CHEAPER.

As the result of an agreement between the National Radium Institute and the United States Bureau of Mines, Department of the Interior, to develop a more efficient process for the manufacture of radium from the carnotite ores of Colorado and Utah, the bureau now has as its share more than \$180,000 worth of radium for use in the sciences. This was secured for the expenditure of about \$37,000. In addition, under the agreement referred to, the bureau of mines has turned over to the National Radium Institute about 63 grammes of radium, and has given to the country a method for producing pure radium compound from the ore for as little as one-third the current price of radium.

When the Bureau of Mines began this work in 1912 it found that the precious carnotite ore, constituting the largest known supply of radium ore in the world, was rapidly going to Europe, mainly to Germany, where it was being turned into radium and then sold back to the United States at fabulous prices.

ELECTRICAL DETECTION OF ORES.

A recent U. S. patent refers to the locating of deposits of ore by electrical means. Bore holes are made in the area under investigation at a distance of several miles apart. Four such holes would be bored, say, five miles apart, and the apparatus used would consist of a sound oscillator and three recording oscillographs. The holes are filled with water, in which the sending oscillator and the receiving microphone are immersed. By studying the records on the oscillographs, and particularly the relation between sound received direct and through echoes, it is possible to form conclusions as to the nature of the intervening rock and the distances of ore deposits in the vicinity.

ALFRED T. MARKS.

NOTES.

In the December number of this *Journal* we published the best part of the speech of Mr. Lloyd George on re-construction after war. The speech is one of the most remarkable delivered by the Premier. It is characteristically fresh. His formulation of what should be done is not the least important portion of the speech. What are the lessons of the war and how best to practically utilise those lessons for the good of the nation? What has the war laid bare as the weakness of the nation and how best to combat it? What are the duties of a statesman in the light of what the war has taught us and how best to accomplish them? These are some of the problems that Mr. George attacks in the speech. The nations' health, the importance of the home, transport problems, the need for co-operation among all classes—these and other subjects are tackled by him in a masterly fashion. Housing of the poor, improvement of health conditions, improvement of communications in rural areas are all urged by him as remedies for the present unsatisfactory economic position. The speech is not without interest to us in India. It shows on what lines progress is likely to be achieved by Great Britain in the coming years. What Mr. Lloyd George says of England is, perhaps, applicable ten-fold to India and a hundred-fold to Mysore. Our death-rates, our housing conditions, our lack of communications are all too well known to need re-iteration now. The remedies that Mr. George proposes are none of them of the heroic type. He means business and so would tackle questions in an earnest spirit. He says:—"I deal not with plans, not with details and above all not with programmes. I am sick of programmes. I deal with what are called, in military language, objectives, something which you mean to get at with all your artillery, with all the weapons in your power. These objectives we ought to

get at, and if we agree as to objectives, do not let us quarrel about methods. Let us keep one people until we get there." That is a characteristic utterance. It conveys a message the world over to all interested not in discussion but action.

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In the address that Mr. Raitt, Cellulose Expert to the Government of India, delivered at Calcutta the other day, there are given some interesting facts and figures about paper and its manufacture. Among other things, Mr. Raitt announced that the nodes or knots of the bamboo which have so far resisted all digestive liquors, can be overcome by the simple operation of totally destroying and opening out their structure by crushing. This has been talked about for sometime in paper manufacturing circles but this is the first time that an authoritative pronouncement has been made on it. If the nodes can be got at in the manner suggested, and if the resistance of the bamboo to efficient and economical bleaching is also possible as Mr. Raitt suggests it is, then, the problem of the manufacture of paper from bamboo is, so far as the technical side is concerned, practically solved. But other difficulties from the manufacturer's point of view, however, still remain. These are raw materials, and manufacturing facilities in or near the raw material forests. Both of these are of primary importance; the one without the other is of little use. Mr. Raitt demonstrates this in telling fashion in his address to which we would refer our readers. His address is of immediate practical interest to us in Mysore because for sometime now the question of a Paper Mill for manufacturing paper from bamboo has been discussed here. The war did not allow of the importation of the necessary machinery so far; but now that the war is over and import facilities are better, it seems opportune to press forward with this matter. In large undertakings of this kind, the best and latest machinery available should be used. Qualified men should be brought out

and employed and all the conditions requisite for business success of the venture should be assured. In Mysore, we have certain of these conditions already and for the rest, all that is now needed is increased attention.

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The Mysore Government have issued a further communique modifying in certain respects their orders in regard to food control. The primary idea underlying the new circular is that as little trouble as possible should be caused to the trade, while profiteering is checked and a steady supply of essential food-stuffs is made possible in the State. The new circular will take sometime to filter down but when it does, it will doubtless go a long way in easing the situation. Merchants and traders have, as soon as they understood the basic ideas of the Government in the matter, come round to take out the necessary license. They appreciate better now that the licensing system is essentially in their own interests and that it is intended to do away with intruders in the business. The Government will doubtless in time do away with certain other features of the original scheme but for this a little more patience on the part of merchants and traders is necessary. The export of food grains from the State to outside areas with a view to profit while a number of people within it are going without them has to be stopped and this cannot be done until the cordon is drawn still tighter than it has been so far. When this is done, the simplicity of the scheme will be perceived in its true lights and there is sure to be less talk about it—or rather against it—than it has been up to now.

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Bulletin No. 84, just issued by the Agricultural Research Institute, Pusa, is entitled "The best means of rapidly increasing the outturns of Food Crops by methods within the power of the Agricultural Department." The material presented consists of notes submitted to the meeting of the Board of

Agriculture in India held at Poona (1917), edited with an introduction, by Mr. J. Mackenna, C.I.E., I.C.S., Agricultural Adviser to the Government of India. According to Mr. Mackenna, the methods by which the produce of a country can be increased fall into two classes:—In the first place, the food supply of a country may be increased by substituting food crops for fibre or other non-food crops or by the breaking up of new lands formerly not under cultivation. These, however, are rather administrative questions dependent either upon the arbitrary order of Government that cropping should follow a certain scheme or on the availability of waste lands formerly uncultivated. The second group of methods which more properly come within the scope of the Agricultural Department are:—(1) introduction of improved varieties, (2) manures, and (3) better cultivation. In the papers which appear in the Bulletin the efforts of the various Agricultural Departments along these lines are recorded. "It must be remembered," says Mr. Mackenna, "that there are considerable limitations to the use of manures. There are also limitations to extensive cultivation on account of the shortage of cattle, while it is probably dangerous to suggest revolutionary changes in well-established schemes of rotation. Advance along these lines must be gradual and the most hopeful prospect of a rapid development depends on the evolution of improved high yielding varieties of crops such as the Pusa, Punjab and Central Provinces wheats and Bengal, Madras, Central Provinces and Burma paddies, combined with an effective organization for the rapid dissemination and distribution of these improved varieties."

His Majesty's Trade Commissioner in India has received from the Department of Overseas Trade various lists of new Industries that have recently been developed in the United Kingdom. These lists contain

the names of Manufacturers of various articles, the production of which was not carried on in the United Kingdom prior to the war, or which was carried on to an inconsiderable extent only. The following are a number of the articles included:—

Ladies' Hand Bags and other similar fancy goods.

Frames for Ladies' Hand Bags.

Galalith Substitutes.

Fibre Suit Cases.

Metal Fancy Goods—Fancy Nickel and Brass Goods such as Perpetual Calendars, Ink Stands, Match Stands, Letter Balancers, etc.

Cheap Metal Cigarette cases.

Metal Photo Frames.

Cheap Metal Framed Mirrors and Nickel plated Shaving Mirrors, Boxes for Shaving Soap Sticks, Soap Boxes, Clinical Thermometer Cases, Furromes for Walking Sticks and other drawn and stamped articles.

Brushware.

Celluloid, Galalith and Corrozo Nut buttons.

Press Studs Push Buttons.

Hosiery Needles, latch and beared.

Wurtemberg Plate.

Cheap Spoons and Forks.

Rolled Gold Wire and Flat Stock.

Machine made fine chain.

Gramophone Motors, Needles and Sound Boxes.

Textiles, Clothing, etc.

Textiles—Glove fabrics—cotton, knitted. Moquettes.

Needlework Canvas—penelope, congress, etc.

Silk piece goods for ties.

Slipper cloth—imitation Camel hair.

Tapestry—cotton.

Mixture yarns—Cotton and wool.

Clothing, etc. Fezz Caps.

Fabric Gloves.

Hardware.

Wickless Oil Stoves.
 Blow Lamps.
 Automatic Mouse Traps.
 Nickel Plated Steel Sheets.
 "Stauffer" Pattren Lubricators.
 Wood Split Pulley for Power Transmission.

Toys.

Dolls, Metal Mechanical Toys, Soft Toys,
 Pianoforte Accessories,—Actions; Wrest
 Pins.

Chemical Porcelain and Glassware; Aniline
 Dyes, Alizarine Dyes, Synthetic Indigo;
 Synthetic Drugs.

Sanatogen; Lysol; Thymol; Synthetic;
 Rubber Sponges, Thermit.

Rubber Goods.

Sponges; Leather Substitutes; Tabs and
 Collets for Ladies.

Suspenders; Vulcanite Pipe Mouthpieces;
 Teats; Erasing Rubber.

Flooring and Tiling; Compressed Asbestos
 Fibre Jointing.

Typewriter Accessories.

Carbons, Ribbons and Spools.

Embossed Wall Pockets,

Lead Pencil; Iris or Pearl Paper; Letter
 Files, metal parts for; Blocking foils for
 Cutter Crush work; Sectional paper.

Ivory Boards; Press—Spahn for Insulat-
 ing; Photographic Paper; Raw and Coated;
 Cigarette Paper, Filter Paper, School
 Chalks.

Cigar Bands and Labels.

Margarine; Dried Vegetables.

Arc Lamp Carbons; Pocket Flash Lamps
 and Batteries; Insulating Materials, Magne-
 toes; Gas Calorimeters (Junker Type);
 Wire Netting Making Machines; Nail
 Making Machinery; Weft Winding Mach-
 ines, Sewing Machines.

The firms interested in any of these
 articles may obtain the list of Manufacturers
 on application to His Majesty's Trade
 Commissioner (McLeod House, 28, Dal-
 housie Square, Calcutta).

The following passage we take from the
 Report by the Government Actuary on the
 working of the Indian Life Assurance
 Companies Act, 1912, for the year 1917:—
 There are at present 68 companies subject
 to the Indian Life Assurance Companies
 Act. Of these 44 are Indian, 17 British,
 4 Colonial, 2 are constituted in Shanghai
 and 1 is an American Company. The
 summaries relating to these concerns are
 now published in a form which has been
 found much more convenient than the former
 cumbrous methods. The particulars of each
 company's accounts are now set forth so
 as to facilitate comparison not only with
 the corresponding particulars of other com-
 panies for the same year, but what is
 frequently more important, with the returns
 from the same company in previous years.
 Summaries of all the valuation returns
 submitted since the passing of that Act are
 also published, together with fairly lengthy
 extracts from the triennial or quinquennial
 valuation statements submitted since the
 previous year's issue of these returns. The
 valuation statements are usually of consider-
 ably greater importance than the annua-
 accounts, and as in majority of cases it will
 be another five years before the next valua-
 tion falls to be made, it has been considered
 desirable to publish such portions as would
 for the next few years clearly show the
 financial position of a company as last
 ascertained. The impossibility of ascertain-
 ing the relation of liabilities to assets from
 an examination of ordinary accounts and
 balance sheets is possibly more pronounced
 in the case of life assurance than any other
 class of business, and forms consequently
 an additional reason for the publication of
 the more interesting portions of the valuation
 statements. The returns from the Indian Com-
 panies show a marked improvement in many
 respects. The new sums assured are nearly
 thirty-five lakhs in excess of the amount in
 either of the previous two years, and although
 the amount is not equal to the pre-war

figure it is satisfactory to see such a marked recovery. The total sums assured remaining in force also show a marked increase and now amount to nearly twenty-four crores of rupees. This is more than one crore in excess of the amount in any previous year. It is interesting to observe the variation in each of the past three years in the ratio to the new sums assured which is borne by the total sums written off from all causes including claims, surrenders, lapses, etc. In 1915, the sums assured written off exceeded the new business. In 1916 they were only slightly less. But last year they did not amount to half of the new sums assured and were nearly one crore less than the 1915 amount. Each year since the Act came into force there has been a decrease both in the expense ratio and in the amount of the sums falling due under claims by death. As was to be expected, the rate of interest earned on these Life Funds again shows an increase. Since the outbreak of war, the net interest rate has increased from under $4\frac{1}{4}$ to over $4\frac{3}{4}$ per cent and a further increase may be expected. This is a very important consideration in view of the fact that Indian Companies issue mainly endowment assurances and under that class of policy the principal source of profit is generally surplus interest.

The Imperial Economic Botanists at Pusa (Mr. and Mrs Howard) in their Report for 1917-1918 state that the sale of Improved Fruit Boxes to the public, which upto 1916 had proceeded very satisfactorily, has latterly been greatly interfered with by the war. Although arrangements were made in 1916 for the delivery the next year of a large supply of Card Board boxes, punnets and crate wood all the consignments were delayed and arrived at Quetta too late. The consignments of Cord-Board Boxes and punnets from Great Britain happened to be shipped to India by the same vessel which struck a mine outside

Bombay and only just reached port. In due course, both consignments arrived at Quetta at the end of the Fruit Season. The crate wood was arranged for in 1916 from two Indian Factories but in each case the delivery did not take place till the middle of 1918 due to the fact that both the Saw Mills were engaged in War work. At the time of writing July 24th 1918, the last of the consignments ordered in 1916 has arrived at and the various boxes and crates can now be put together. It was hoped that the box-boards prepared in India from locally grown timber would be considerably cheaper than similar supplies from Norway, Great Britain and Japan, but this expectation has not been realised. Indian Boards have proved inferior to and considerably dearer than imported material while Railway freights now charged for full wagon loads are enormous. Till more normal conditions of supply and transport obtain and till importation from Norway and other countries is again practicable, it will scarcely be possible to collect any more fruit box material at Quetta. The supplies already in hand are expected to last till 1920 after which no more orders will be sent till after the War. This work is financed by means of Treasury advances and purchases and sale have to balance each other. The system does not, therefore, admit of the holding of large stocks of unsold materials and is quite unsuited to the trade conditions of the present time. As soon as the War is over and the prices settle down, the supply of these boxes will be handed over to a local Agency. The demand is now considerable and the suitability of the various boxes and crates have been thoroughly tested. Railway concessions have been arranged for and are now in working order. The whole question has passed the experimental stage and will be dealt with by the trade at the earliest opportunity. We trust that people down in Mysore will take note of this experiment.

The Season and Crop Report of the Madras Presidency for the agricultural year 1917-18 states there has been a steadily increasing demand for castor seed and oil during the year. It is required at home as a lubricant for aeroplane engines, and is being used on an increasing scale in India for lubrication and for burning in place of mineral oils which have become scarce owing to the lack of freight for their import from Burma. Owing to buying for export being controlled by Government, the price at first rose only slowly from Rs. 12-4-0 per bag of 165 lbs. in July 1917 to Rs. 15-8-0 in January 1918 and Rs. 17-4-0 in June. This small increase is not likely to stimulate greatly increased sowings for 1918-19 in view of the high prices of cotton and grains. However, all restrictions on buying castor were removed in July with the result that the price rapidly rose and is now about Rs. 34 per bag. There is money in castor.

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We learn from the *Board of Trade Journal* that the National Association of Raw Silk Industry of Japan has sent a representative to the United States to study the silk conditions in the country and keep the Association informed on all matters pertaining to silk. The Japanese Association was founded in 1915, with the view of becoming the central organisation of many similar local associations. Its establishment being sanctioned by the Raw Silk Industry Act, it is a public institution, to which all local associations in Japan are compelled to join by the law. The objects of the Association, states the *American Silk Journal*, are to bring unison among organised associations, to develop the export of raw silk, and to increase the interests of the raw silk industry. Here is a useful hint to us in Mysore.

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Since 1916 the Hides and Tanning Materials Committee of the Imperial Institute have been at work on the difficult question of finding markets within the Empire for the Indian raw hides and skins, which before the war were exported to foreign countries, the hides chiefly to Germany and Austria and the skins to the United States. The Committee have pre-

sented several reports, which are under consideration by the Government of India and in due course full information as to the results of their deliberations will no doubt be made public. It is clear however from the lecture given recently before the Royal Society of Arts by a member of the Committee, Sir Henry Ledgård, that the Committee are convinced that a market for these hides can be found within the Empire, partly by increased tannage in India and partly by export to the United Kingdom and to the Dominions, especially Canada, Australia and South Africa, and it is known that the Committee have already taken action to familiarise tanners in Canada and South Africa with the good qualities of Indian hides. The first step towards effective post-war action in connection with hides and skins, as with other essential raw materials, is complete and accurate knowledge of the trade. The Imperial Institute provides this information in an article entitled "Indian Hides and Skins" published in current number of its *Bulletin* (No. 2 of 1918: John Murray, 2s. 6d.) just issued. The article deals exhaustively with Indian sources of supply of hides and skins, estimates the present output in comparison with that of other competing countries and discusses in detail the trade figures in pre-war times and the changes in destination of exports brought about by the war. This information should be of great value to all concerned in this trade and the industries dependent on hides and skins as raw materials.

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In this issue Mr. W. P. Campbell of the Forest Products of Laboratories of Canada discusses the fuel value of wood. The fuel question is at present a topic of the hour in Mysore. Mr. Campbell's treatment of the subject leaves little to be desired. We shall be glad to see the subject of Mysore woods taken up in the manner in which Mr. Campbell has discussed the more common Canadian woods. The subject is well worth careful study and we commend it to those interested in forestry.

GLEANINGS.

The Imperial Institute, in continuation of its publications with reference to the mineral resources of the Empire, has now issued a map with diagrams indicating the sources within the Empire of the chief metals of commercial importance. The out-line map shows the occurrence in each British country of important metallic ores, and also the existence of deposits at present unworked. The diagrams attached to the map give for 1915 the production of each country, as well as the total British output and the world's output of each important metal or ore. Among the striking features disclosed are that in the case of gold more than half the total production is within the Empire, the principal producer being South Africa; with silver, the British proportion is rather less than one-fifth, the principal producer being Canada; in the cases of manganese, chromium, tin, and molybdenum, the British proportion is near one-half. It is remarkable that there appears to be scarcely any production of the valuable metals mercury and platinum within the Empire, so that we are almost entirely dependent on foreign countries for supplies.

Replying to a question in the House of Commons on October 24th, Mr. Kellaway (Ministry of Munitions) said that a scheme for recovering potash on a commercial scale from the blast furnaces used in the manufacture pig-iron was approved last year. In consequence the Ministry had encouraged the installation at various ironworks of gas-cleaning plant designed to extract from the furnace gases potash-bearing dust. Certain of these plants were now in operation, others were under erection, while others, again, were in course of construction. A factory had also been erected at which muriate of potash, free from deleterious impurities, was being manufactured from such dust. This factory was capable of dealing with all the dust that could be collected by the gas-cleaning plants now under erection and construction. As other gas-cleaning plants were installed, it was proposed to erect other factories in suitable localities. A small amount of potash was also being obtained as a by-product of

the cement industry, and experiments were at the present time being carried on with a view largely to increase the amount so recovered.

The *Railway Gazette* of September 13th says that the iron and steel mills of the United States are greatly in need of scrap iron, the demand for this material far exceeding the supply. The railways have always been one of the largest sources of supply for scrap iron and steel, and the prices now being paid for such materials are sufficiently high to warrant special efforts in the collection of scrap. Apart from this consideration, it is felt that the railways should do their best to make up the deficiency for patriotic reasons. It has been calculated that if the whole of the iron and steel scrap in the country were marketed there would be no shortage of steel, but this can only be accomplished by very great effort. The railways can not only be of great help in collecting and marketing their own scrap but they can do much by urging others with whom they come in contact to do the same, and by helping to promote and encourage "Sell Your Scrap" campaigns in the different communities which they serve.

The wonderful possibilities of Tasmania for the development of water-power are commented on in *Power*. The island possesses just in its centre, on a high elevation, a lake sufficiently large to provide its industries with all the electrical power that may be needed for some time to come. The basis of the whole system is the Great Lake. With a catchment area of 216 square miles, and a water area of 50 square miles, it forms an ideal foundation for a great hydro-electric enterprise. A dam that has been constructed on the southern outlet of the lake provides for an even depth of 11 feet above sill level, and experience has proved that this will be sufficient to guarantee a regular flow of water. Experiments made during the first year of operation have shown that during a year of normal rainfall a total of 70,000 horse-power can easily be obtained from the lake.

A loan on \$1,000,000 has been made to the Forest Service from the President Wilson's special defence fund to combat fires in the national forests of North-western and Pacific Coast States.

ECONOMIC NOTES.

AGRICULTURE.

The Neglected Pomegranate.

We take the following article on Pomegranate cultivation from the *Barbados Agricultural News* and in doing so would add that though at one time Bangalore was famous for its pomegranate fruits, they are far too scarce now. Fruit growing has still to be developed in the *State* and in any scheme of fruit culture the pomegranate ought to occupy a large space. Our contemporary says:—

Of all fruits at present grown, merely as a fruit pleasant to the taste, the pomegranate is probably the one of which we have the earliest records in history. It is mentioned with honour in the earliest writings extant of the nations who are the parents of modern civilization. Homer mentions it in the *Odyssey* as grown in the gardens of Phœnicia, and the references to it in the Bible, from the Mosaic books onward, are frequent, as will be easily remembered.

The pomegranate is probably a native of the western parts of Persia. Thence it was dispersed eastward and westward to China on the east, and along the borders of the Mediterranean to the west, very early in historic times. Wherever it was introduced it was held in high esteem as a fruit. The conquerors of the Western Hemisphere, among other fruits, such as the orange and its relatives, did not fail to introduce the pomegranate, so long cultivated in Southern Spain. Since then the cultivation of the pomegranate has spread through all the tropical and semi-tropical regions of the New World. And yet to-day it is one of the most neglected fruits in these parts of the world; the reason being probably want of care in cultivation, and no attention to selection, which has caused a deterioration on the fruit.

In the United States, however, there has been of late more interest in this neglected fruit. There are still descendants of the old pomegranate trees planted by the first Spanish settlers in California. These are still of a fair quality, but distinctly of a mongrel seedling type. As a possible fruit for export to northern markets the pomegranate has been the subject of experiments at the College of Agriculture Experiments Station, Berkeley, California. Form *Bulletin* No. 276, January 1, 1917, the following particulars as to variety and culture are taken.

There are two general types of pomegranate grown in California at present, the white-flowered type and

the pink or red-flowered type. The white flowered type is considered undesirable for cultivation as wanting in attractiveness, flavour, and keeping quality. As to the red-flowered type, the different varieties vary in every direction, but among them there seem to have been evolved varieties of great merit. There are only five which at present are found to be of value in the fruit market. Of these the one which is most in favour in California, and which has taken a place in northern markets, is the one which is designated Wonderful. Apparently this is a sport from Florida cuttings brought to California in 1896.

As was said above, the pomegranate is a very neglected fruit in these islands, because, like the Californian variety before selection was brought to bear on it, the pomegranate in the West Indies is only a mongrel seedling. The importation of fine varieties, the selection of promising native varieties, and a little attention paid to its cultivation might bring to public favour in these islands this most ancient fruit.

The climate suits the pomegranate for although it is grown in the East in almost desert regions, being well adapted to withstand drought, yet it will grow and fruit well under conditions of heavy rainfall, thus making it adaptable to dry islands such as Antigua, or to wet ones such as Dominica. The pomegranate, therefore, in its improved varieties may be well worth experimenting with by our West Indian horticulturists.

The propagation of the pomegranate in the West Indies, as far as is known by the writer of this article, is only by seedlings. These can never be depended upon to reproduce exactly the characteristics of the parent plant; hence the failure to keep up a good type of plant. It may, however, be easily grown from cuttings. Hardwood cuttings 10 to 12 inches long, and from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, cut from the shoots or suckers of a pomegranate tree, will grow readily when planted in the open ground. In this way a desirable variety can be maintained and multiplied. In this way also the pomegranate may be employed to form a most efficient and ornamental hedge. Cuttings set out in a double row, say, 8 feet by 4 feet, and pruned strongly in early stages of growth, will soon form by growth of suckers an impenetrable hedge, and one which in the blossoming season is a thing of beauty.

The pomegranate is no more exacting in its soil requirements than it is in the moisture that it needs. It does best, however, on deep soils, of a fairly heavy nature.

It is not probable that any trade to northern markets in pomegranates will soon be accessible to West Indian growers, although the tough rind of the pomegranate endues it with remarkable keeping powers; yet as a most refreshing and piquant fruits, when of good variety and in good condition, it is to be recommended to more attention on the part of our local horticulturists for local markets.

THE UTILIZATION OF SISAL WASTE.

We have more than once, says *Tropical Life*, urged the advantages that would accrue to planters of sisal, maguey, manila or other fibres on a large scale, if experiments were made with the view of ascertaining whether the fibre waste could not be utilized for paper making, and if the liquor expressed from the leaves or stems was not a suitable raw material to make alcohol for motor fuel, etc. In our issues of April and May, 1912, we fully discussed the extraction of alcohol from sisal refuse. Now we hear that in British East Africa experiments have been carried out for a year or two to try and ascertain what could be done with sisal waste.

The results, however, confirmed those previously obtained. A preliminary analysis of the juice of leaves from the coast gave just about the same value for the sugar content as was obtained for the Highland material, namely, not more than 3 per cent.

In Yucatan, where sisal waste has been fermented with success and alcohol from such has been put on the market (according to report), the sugar content never went below 9.4 per cent and at the end of their dry season is stated to have reached as much as 14.1 per cent. Most of the alcohol was produced from leaves containing on the average 12 per cent sugar.

As stated in last year's report, a yeast was isolated from sisal plants which fermented a glucose solution, but which was quickly killed in the sisal extract. This was no doubt due to the action of organic acids in the extract which were present in great quantities.

On neutralization with sodium carbonate and the addition of a small quantity of glucose, it was found possible for the yeast to live in the sisal extract, but no fermentation was induced.

Further work on more exhaustive analysis and on the neutralization and destruction of the organic acids was not completed owing to the analyst, for want of time, being unable to carry out experiments of this nature.

The work of discovering and isolating further yeast ceased owing to the absence of the official on more pressing work.

It would be of great interest to continue the work, for the analyst was by no means certain that the 3 per cent represented the whole of the sugars contained in the sisal juice. Moreover, the organic acids present might prove of importance (oxalic acid, for example, is found to be present in any quantity); but the whole problem is one of careful research.

We hope these experiments, therefore, will be continued not only in East Africa, but elsewhere as well, as there never was so urgent a demand for raw material for paper making and for commercial alcohol as at present.

COCO-NUT POONAC AS A MANURE.

Mr. Kelway Bamber, Agricultural Chemist to the Government of Ceylon, has published the following particulars showing the value of coco-nut poonac as manure (see Leaflet No. 1 of the *Department of Agriculture, Ceylon*, price 5 cents).

Owing to the difficulty of freight and consequent lower demand the price of coco-nut poonac has fallen considerably, and the question arises as to its manurial value, and whether it could be profitably used as a manure instead of a food.

The following is a manurial analysis of an ordinary coco-nut poonac:—

	Per cent.
Nitrogen	3.33
Phosphoric acid	1.47
Potash	1.29
Lime	0.90
Soda (as salt)	1.17

It is rather poorer in nitrogen than rape cake, which contains 4 per cent of that constituent, and which costs at present Rs. 95 per ton, equivalent to Rs. 1.06 per lb. of nitrogen.

The other cakes used for manurial purposes and now on the market are castor cake in two qualities and ground-nut cake. Their nitrogen content, cost per ton and cost per lb. of nitrogen, are as follows:—

	Guaranteed percentage	Cost per ton	Cost per lb. nitrogen
		R.	Rs. c.
Castor cake No. 1 ... 5 $\frac{1}{2}$ % nitrogen	100	0	89
„ No. 2 ... 4 $\frac{1}{2}$ %	95	0	94
Ground-nut cake ... 7 $\frac{1}{2}$ %	110	0	70

Allowing a value to the nitrogen equal to that in ground-nut cake, the value of coco-nut poonac per ton would be Rs. 52.20 in Colombo.

Ground-nut cake contains a somewhat similar proportion of phosphoric acid and potash, so that in this respect the manurial value is the same.

The equivalent amounts of coco-nut poonac required to give the same amount of nitrogen as 100 lb. of the various other cakes are :—

	lb.		lb.
Ground-nut cake	100 =	Coco-nut poonac	210
Castor cake No. 1	100 =	" "	150
" No. 2	100 =	" "	135
Rape cake ...	100 =	" "	120

Although under ordinary circumstances the value of coco-nut poonac as a food for cattle and horses is too high for it to be used directly as a manure, present conditions render its use advisable, especially as it is liable to become rancid on keeping, unless very thoroughly dried.

USES OF STRAW.

The Highland and Agricultural Society have issued a memorandum on the utilisation of straw, by Dr. J. F. Tocher, Aberdeen, the consulting chemist to the Society.

Dr. Tocher states that the total area under crops and grass in Scotland for the year 1915 amounted to 4,781,000 acres, of which 3,290,000 was arable land, leaving 1,491,000 acres under permanent grass. The total area under oats was 982,600 acres; under barley, 149,000 acres; and under wheat 77,000 acres. We should thus expect on an average at least about 1,200,000 tons of straw from oats, etc., annually. It appears that the Board of Agriculture for Scotland desires that about 350,000 additional acres should be brought into cultivation during 1918. If this area was entirely grain-producing it would mean that over 420,000 additional tons of straw would be available at the fall of 1918 and have to be utilised in some way or other.

It has been suggested that, if straw were rendered more digestible, a greater quantity of it would be used for feeding purposes. Under a process patented a few years ago, straw was treated with a weak solution of caustic soda and heated under pressure for about sixty hours. The effect of the soda under these conditions was to dissolve the encrusting material of the straw, and a great deal of the soda was itself used up by the acid formed during steam pressure. The organic matter of oat straw treated in this way showed a digestibility co-efficient of 60 per cent as against 40 per cent for the original straw. Digestion of straw by soda in large boilers

under pressure could be undertaken by farmers themselves, or, as a side line, either by manufacturers of feeding stuffs or by others who would be willing to use the capital necessary for such a purpose.

PAPER AND STRAW BOARD.

Paper manufacturers see no reason why straw should not be much more largely used in the manufacture of various grades of paper, provided constant supplies can be obtained, and provided also that farmers would take the trouble to keep straw reasonably free from the stalks of docks, thistles, and similar plants. These weeds are the cause of great trouble in preparing straw pulp, and their presence in straw raises the cost of production. Straw pulp may be looked upon as a substitute for esparto, although it does not seem probable that straw can ever entirely supersede esparto, the ideal fibre in paper-making. The best quality of straw pulp could be freely used in the hardening of ordinary writing paper, which is largely composed of wood and esparto pulps, but which could be made entirely from wood and straw pulps. Experiments were recently carried out in two Scottish miles for the purpose of determining the yield and of testing the utility of pulp obtained from straw. Both wheat straw and oat straw were tested, and fairly satisfactory results were obtained. In one of the tests docks and thistles gave trouble. In the other test, strainings after bleaching were found to consist of binder twine, which is waste material not usable by paper manufacturers, but which could be utilised in making straw-boards or for other purposes. A yield of pulp was obtained from oat straw equal to 35 per cent of the weight of bonedry straw. Oat straw is not quite so knotty as wheat straw, and therefore is less difficult to handle from the point of view of the paper manufacturer. The adoption of straw instead of esparto as a source of pulp in paper-making would materially aid in the utilisation of straw, but it is unlikely that the whole surplus of a season could be used up by papermakers.

The utilisation of straw for straw-boards could be effected by paper manufacturers. Special machinery would be necessary, and, naturally, before manufacturers would sink their capital, they would require some assurance that the supply of straw would not only be sufficient, but also that the manufactured article would be bought and sold under conditions which would be effective against the dumping which existed up to the outbreak of war. The cheapest straw-boards are made from straw and waste material, and it seems manufacturers in this country have been unable to compete with continental manufacturers, who before the war sold it at about £7 per ton. The present price for such straw-board would be about

£11. It should be possible for manufacturers in this country to adapt themselves to the new circumstances and to turn out suitable straw-boards such as are found on the covers of all ordinary books. The proportion of straw used in the manufacture of straw-boards would be very much greater than that used in the manufacture of paper on account of the variety of uses of straw-board. While, therefore, a certain amount of straw for paper making would be utilised, straw-board manufacture is the practical outlet for the expected surplus, and should receive the immediate attention of the authorities. The problem is an economic problem, and therefore, comes within the purview of the recommendations of the Economic Conference. Paper manufacturers and others directly interested in the manufacture of paper and straw-board should have no hesitation in preparing a case to present to the Government asking for assistance in founding a straw-board industry, and for guidance and aid in the manufacture of straw pulp, and generally in the proper utilisation of home straw, in order to prevent waste and to increase home production.

PRODUCTION OF NITROGEN.

It seems desirable to mention in connection with the utilisation of straw its possible value as an agent in increasing a growth of azotobacter and other nitrogen-fixing organisms naturally present in the soil. The mineral and vegetable constituents of straw have been found to promote a rapid growth of azotobacter. Experiments with straw alone and with straw containing about one part of arsenic in 100,000 parts have been found to give interesting and valuable results, and, in particular, confirm previous results as to the value of arsenic as a stimulant. There was a distinct increase in the amount of nitrogen due to the rapid multiplication of these organisms. The further suggestion is, therefore, made that straw which cannot be used for ordinary feeding purposes, and any surplus straw left over after the wants of agriculturists, papermakers, and straw board makers have been fully supplied should be used (1) in the making of a more digestible straw by means of soda solution, and (2) in the treatment of straw as an agent to promote the growth of nitrogen-fixing organisms for the purpose of transferring from the atmosphere to the soil an appreciable proportion of the valuable fertiliser constituent, nitrogen, in a form available for plant growth. If straw proved a suitable agent for accumulating nitrogen economically, then, if properly treated and properly stored, its value would increase, and not decrease in keeping. This would be directly an advantage to agriculture, and would thereby be indirectly an advantage to the State in the further production of food.

SERICULTURE IN BENGAL.

We take the following from the Report of Bengal Agricultural Department for 1917-18:

The operations for the improvement of the silk industry in Bengal were continued on the lines of the previous under the general control of a committee consisting of the Director of Agriculture, the Collectors of Murshidabad and Mulda, and three non-officials. No action has been taken on the Report of Mr. Lefroy, late Imperial Silk Expert. So far as the Report concerns the Bengal Industry, it recommends little more than the adoption of the recommendations of the Oldham Committee of the year 1906. It is generally held, that if the *Pebrine* disease of the silk-worm can be successfully combated the silk industry (at least so far as it concerns the production of silk cocoons) would still be economically sound. It is further agreed that with *Polyvoltine* races the produce of disease free worms will even in the event of their contracting pebrine during their "Education" succeed in spinning cocoons. As there appears to be little hope of the silk-worm rearers in Bengal producing disease free seed for themselves the problem becomes one of producing a sufficient quantity of such seed for the industry. The Department at present only supplies only a small portion of the total requirements of seed for the Mulberry Districts in Bengal and the problem would then at the first sight seem to consist simply in the multiplication of our present efforts. Not every type of organization, however, is capable of expansion owing to the difficulties of supervision, and supervision in the present case is all important. It is clear, therefore, that the expansion of the Sericultural Department cannot be along present line. In fact, an entirely new type of organization will have to be evolved before any considerable expansion is possible.

Babu A. C. Ghosh held the post of the Superintendent of Sericulture throughout the period under Report. He spent 244 days on tour, and constantly inspected the various nurseries. High prices have been obtained for the nursery seed cocoons which have sold at a premium over local produce. The total receipts from the nurseries for the nine months from 1st July 1917 to 31st March 1918 amounted to Rs. 32,662 against Rs. 28,737 of the preceding 12 months due to Revenue returns on an increased expenditure on manures, etc., and higher prices for "seed". The total expenditure was Rs. 61,093.

Ten boys passed from the Rajshahi Sericultural School and two from the Sericultural Class at Berhampore. It is reported that most of the passed students have constructed model rearing houses and have been successful in rearing.

Cross Breeding Experiments:—The hybridizing experiments initiated by M. Grangeon at Berhampore before he left for Military duty in France in 1914 remained in charge of Mr. P. C. Chaudri, Superintendent of the Berhampore Central Nursery. The Berhampore nursery has been temporarily set aside for testing cross bred races on a large scale. Some of these are apparently much superior to local *Mistari* races, but experience of their hardiness and immunity to disease is necessary before distributing any of them to silk-worm rearers in the districts.

DAIRYING.

A correspondent writes to *Farm and Home* :—

SALTING OF BUTTER.

Some people prefer a very mild, creamy butter, while others like a pronounced salty taste. Generally, however, a medium salting of, say, half an ounce to the pound will be best for ordinary retail trade. Whether in large or small quantities, there is not the slightest doubt that salt has a considerable value in butter making. It certainly helps to improve or bring out a good flavour, and it also serves to disguise, to a certain extent, a somewhat "off" flavour although here, of course, there is no fear of its being abused to cover faults due directly to improper ripening of cream or lack of cleanliness in the dairy. But salt is principally used on account of its preservative properties. It is impossible to keep butter sweet for any length of time unless a certain proportion of salt is worked into it during the process of manufacture. That is why one uses such a large quantity of it in the potting of butter for storage. Probably too little attention is paid to the use of salt in farm butter-making dairies, and the result of this is that the maker is more or less careless as to the quality of the article he or she is using. There are at present only a few good brands of pure dairy salt on the market, and it is most essential to use one of these if the best results are to be secured. Salt, in the true sense of the word, and, as far as butter-making is concerned, should consist of nothing more than sodium chloride. But many so-called dairy salts contain a great many things besides this compound. When it is remembered that anything in salt besides sodium chloride is bitter and so tends to impart a bitter flavour to butter the necessity for using absolutely pure salt will at once be apparent. Ordinary salt is no use at all for this purpose and it must be specially prepared for butter-making; and in the course of this preparation all impurities and foreign substances must be entirely eliminated. The latter are present in rather a large quantity in ordinary household salt, which explains why that commodity is so coarse and cakes so quickly. Specially prepared salt never cakes in the most humid of atmospheres, for it contains nothing that will absorb and retain the moisture. In some cases very injurious, and even poisonous, substances have been detected in salt crudely obtained by merely evaporating brine. Barium chloride, a virulent poison, has been found in small quantities and many other substances that are known to have a bad effect on its flavour and keeping qualities of butter.

A GOOD DAIRY SALT.

A good dairy salt should consist of at least 28 per cent of sodium chloride; it should be readily soluble in water, and ought to retain its dryness indefinitely under suitable conditions. Gypsum, or anything of foreign nature, does harm to the butter, and entails a great waste, so that in the end it is really more economical to purchase a pure dairy salt at, say, 3s. 6d. per cwt., than a cheap but vastly inferior product which very likely contains a large proportion of calcium chloride—a compound that has the distinction of being a very powerful absorbent of moisture. As a rule, dry salting is practised in farm dairies, although, as a matter of fact, the best method of salting butter is by means of bringing. The latter is, however, the more expensive process, and so it is confined to small dairies, and where exhibition butter or produce of a very high standard of quality is being produced.

For dairy salting the actual quantity of salt used may vary from quarter to half an ounce to every pound of butter according to the degree of salting required. Care must always be taken not to use too much salt, for an excessive quantity usually destroys the volatile fats in the produce, and so spoils the characteristic flavour and aroma associated with first-class produce. Needless to say, whatever quantity of salt is used, a certain amount of waste is incurred, as a proportion of it is carried away in the butter-milk which escapes from the grains when the butter is worked. But the presence of salt itself has some good effect, even as far as the actual waste is concerned, for it helps to liberate the butter milk in that process. To calculate the amount of salt required, the grains should be scooped out of the churn into a muslin cloth and weighed. The correct proportion can then be easily estimated, and when the quantity of salt has been weighed out it should be sprinkled evenly over the grains on the worker, and left to soak in for about ten minutes to a quarter of an hour. In the meantime the butter should be covered with a fine muslin cloth. Next, the grains should be given a good working, so as to get rid of the butter milk, and afterwards the butter should be allowed to stand for about twenty minutes, then worked again, and finally made up. Work by means of downward pressure alone, and never with a sliding motion, for this will inevitably spoil the fine granular texture of the butter, and prevent the salt from being evenly distributed throughout the mass. Practically double the quantity of salt is required in bringing as in dry salting, but a certain amount of economy can be effected by washing the butter thoroughly before adding the brine, and using the same brine again for another churning on the same day. To make a suitable brine, dissolve 1 to 2 lb. of salt in a gallon of water, according to requirements, and strain it into a churn through a piece of fine butter-muslin. Such methods of salting will usually distribute the salt much more evenly in the butter than dry salting.

INDUSTRIES.

The Utilisation of Rice Straw and Rice Husks.

The following account of the uses to which rice straw and rice husks can be put is given in the *Bulletin of the Imperial Institute* :—

RICE STRAW FOR PAPER-MAKING.

A sample of rice straw was forwarded from Egypt in April 1917, in order to ascertain its suitability as a paper-making material.

The sample consisted of clean rice straw of brownish-yellow tint. It was examined with the following results :—

	Per cent.
Moisture...	11.8
Ash ...	17.6
Cellulose...	50.0

Length of ultimate fibres, 0.6 to 3.0 mm.; mostly 0.9 to 1.3 mm.

The straw was submitted to treatment with varying quantities of caustic soda under conditions similar to those usually employed for the manufacture of paper pulp, with the results given in the following table :—

Experiment	Caustic soda used		Conditions of boiling		Yield of dry pulp expressed on the straw as received
	Parts per 100 parts of straw	Parts per 100 parts of solution	Time	Temperature	
			Hour		Per cent.
A	14	4.0	4	140°C.	44
B	10	2.5	4	140°C.	50
C	8	2.0	4	140°C.	52
E	6	1.5	4	140°C.	53

The pulp obtained in these experiments was in all cases of pale colour and yielded a strong opaque paper of excellent quality which did not shrink greatly on drying. Except in the case of experiment E the pulp bleached easily to a very pale cream colour, almost a pure white.

A further experiment was made in order to ascertain whether the straw could be converted into a satisfactory pulp by boiling with milk of lime under the following conditions :—

Experiment	Lime(CaO) used. Parts per 100 parts of straw	Conditions of boiling.		Yield of dry pulp expressed on the straw as received
		Time	Temperature	
		Hours		Per cent.
F	20	12	140°C.	56

The pulp produced by this method was bright yellow-brown and did not beat easily. It yielded an opaque paper of fair strength, but it could not be bleached satisfactorily. This pulp should, however, be quite suitable for the manufacture of brown paper and straw board.

It will be seen that this rice straw gives a good yield of pulp, and only requires mild treatment, *i.e.*, the use of comparatively small amounts of caustic soda to produce a pulp which will bleach easily to a pale cream colour. The advantage which rice straw possesses of only requiring small amounts of caustic soda to convert it into pulp will, however, be counteracted to some extent by losses in the materials containing a large proportion of silica.

The results obtained at the Imperial Institute with this Egyptian rice straw confirm those already recorded in the United States, and show that the straw when treated by the soda process yields pulp of good quality which is suitable for the manufacture of white paper. The straw will also serve for the production of straw board and brown paper if treated by either the soda or lime processes.

It is improbable that rice straw could be remuneratively exported from the producing country as a paper-making material in normal conditions, but if adequate supplies are available, its conversion into "half-stuff" for export would be worth consideration. It is also possible that the rice straw might be used locally for the manufacture of paper or straw board, either to supply the requirements of the local market or for export.

RICE HUSKS.

The profitable utilisation of the enormous quantity of rice husks produced in the milling of rice has long been under consideration. It has been suggested that they might be used for paper-making, and as no experiments on this subject appear to be on record, the matter was recently investigated at the Imperial Institute.

The sample of rice husks examined contained 7.9 per cent of moisture and the dry husks yielded 14.7 per cent of ash and 42 per cent of cellulose. The

ultimate fibres varied in length from 0.5 to 1.5 mm. being mostly from 0.5 to 0.7 mm.

The husks were treated with caustic soda under conditions similar to those employed at a paper-mill with the following results:—

Caustic soda used		Conditions of boiling.		Yield of dry pulp expressed on husks as received
Parts per 100 parts of husks	Parts per 100 parts of solution	Time	Temperature	
		Hour		Per cent
16	4	4½	140°C.	36

The pulp contained a large proportion of gelatinous material which could not be satisfactorily removed by beating and washing. It furnished paper of a medium brown colour which was very weak and brittle and cracked when folded. The pulp could not be satisfactorily bleached.

The results of this experiment indicate that rice husks are unsuitable for the manufacture of paper. The pulp might be used as a filler in admixture with longer fibred pulps for the manufacture of low-grade paper or straw board, but it is somewhat unlikely that its preparation for such purposes would be remunerative.

MANUFACTURE OF MATCHES IN RANGOON.

Mr. A. J. Butterwick, P.F.S., contributes the following article to the October number of the *Indian Forester*:—

At the end of 1911 and the beginning of 1912, the writer was placed on special duty to mark timber for the match factory of Messrs. Lim Soo Hean & Co., Rangoon, in the Mahuya and Paunglin Reserves, Hlegu Range, which, at that time, was a portion of the Pegu Forest Division. The match industry in Rangoon was then in its infancy, and it was not known for certain at that time what timbers were suitable for it or not. According to orders received, the writer marked the following species for the match firm:—

1. Letpan (*Bombax malbaricum*).
2. Didu (*Bombax insigne*).
3. Thitpok (*Tetrameles nudiflora*).
4. Setkadone (*Trewia nudiflora*).
5. Tein (*Stephegyne parvifolia*).

6. Taung thin baw (probably a species of *Sterculia*).
7. Ma-u (*Anthocephalus Cadamba*).
8. Odein (*Ehretia laevis*).
9. Shawbyu (*Sterculia foetida*).
10. Hmondaing (*Kokoona littoralis*).
11. Taungmeok (*Alstonia scholaris*).
12. Budalet (*Elaeocarpus locunosus*).
13. Gwe (*Spondias mangifera*).
14. Thayet (*Mangifera indica*).

The above particular kinds were very probably selected as an experimental measure, as their timber was lightish in colour, and the logs floated easily even when green. The habitat of almost all of them was the damp evergreen forests, which are so commonly found covering the alluvial land along streams, and which are annually inundated during the rains. One of the predominating species of forests is a kind of cane called danon or zanon (*Calamus arborescens*). The logs obtained from the above-mentioned trees were floated down to Rangoon by way of the Mahuya and Paunglin Chaungs, which in conjunction formed the well-known Pazundaung Creek.

At that time, the writer was very keen to visit the match factory in Rangoon and see which timber was found suitable for the industry and which unsuitable. As he was shortly after transferred from the Pegu Division to the Forest School, Pyinmana, opportunity did not offer for some time. In December 1917, however, when on tour with the students of the Forest School, a visit to the Rangoon match factory was one of the items of the itinerary. The proprietors, Messrs. Lim Soo Hean & Co., not only allowed the School to see their match factory at work, but also very kindly deputed one of their representatives to explain to the students all the different stages in the manufacture. From that visit and also from a subsequent letter from the firm, the following notes have been compiled. The writer is much indebted, therefore, to Messrs. Lim Soo Hean & Co., Rangoon, for all the help given, and ventures to publish herewith the information obtained from them in the hope that it may be of some interest to the readers of the *Indian Forester*.

The factory is situated on the right bank of the Rangoon river, 6 miles below the capital, near a village called Kanaung. As far as it was gathered, the site was chosen for no other reason but that Messrs. Lim Soo Hean & Co. had a rice factory there originally, and it was thought that the machinery of both could be worked by one superior Engineering staff. Besides this, the site was very convenient for a match factory being close to Rangoon and right on the banks of the river. The

factory was opened in 1909. The only timbers which are at present in use in it are Letpan (*Bombax malabaricum*) and Shawbyu (*Sterculia foetida*). The former is used for the box-covers and for the sides of the drawers, the latter for the splints and for the bottoms of the drawers. Messrs. Lim Soo Hean & Co., have found all other woods a failure for one reason or other. Even the Shan States pine (*Pinus Khasya*) has been tried, but it too was found to be unsuitable as the knots in the wood chipped the sharp keen edges of the peeling knives in their machines, and the exuding resin clogged their machinery. The Letpan and Shawbyu logs are at present obtained chiefly from the Shwegyin Division on the Sittang river; Government duty costs the firm Rs. 2 a ton and carriage from Shwegyin to Rangoon via the Pegu-Sittang Canal Rs. 13 a ton.

The following essentials are required in the Letpan and Shawbyu logs. They must be green and as cylindrical as possible. Also the timber must not be spongy and brittle like cork, as this causes the veneers to break off during the peeling. Logs ranging in girth from 4' 6" to 9' (without bark) are most in demand. Each log is dragged up a slipway from a small inlet from the river. The bark is then removed by hammering and hand-peeling. This bark is useless for cordage, as salt water has thoroughly soaked into it and ruined its usefulness. After the bark has been torn off, the logs are cut up into lengths of 2' 2" by a straight cross-cut saw worked by a small machine. Each 2' 2" piece is then placed on to the veneering or peeling machine.

The log is revolved round at a great speed towards the table, which is about 12' long, and, at the same time, the knife keeps eating into it, advancing very gradually according to requirements. Thin sheets of wood varying in thickness from $\frac{1}{10}$ " to $\frac{1}{16}$ " are, therefore, rolled on to the table and helped on by men standing along the sides. At the commencement, the first 2 or 3 sheets are broken and non-continuous, as the logs are very seldom cylindrical. These are rejected until continuous sheets of wood are obtained. In a very short time the log is whittled down to a cylinder about 4" in diameter. This is rejected as the wood near the pith is considered too spongy and brittle for veneers. There are altogether five such veneering machines, one for the splints, one for the bottoms of the drawers, one for the sides of the drawers and two for the box-covers. The first two kinds use Shawbyu timber and the next three Letpan. The machine, which peels the logs for the splints, divides at the same the wooden sheets into halves; each half, therefore being about 1' 1" broad. The machine for the bottom of the drawers at the time of peeling

also divides the sheet into 11 portions, each being 2 $\frac{1}{4}$ " broad. There is, accordingly, a small wastage of about an inch here. The machine for the sides of the drawers at the time of peeling, not only severs the sheets into three portions, each being about 8 $\frac{1}{2}$ " broad, but also scratches on each portion lines to mark off the places where the folding will afterwards be done when the drawers are finally made. Similarly the machines for the box-covers at the time of peeling not only sever the sheets into five strips, each of 5" width, but also scratch on each strip the places for the subsequent folding.

From the peeling or veneering machines, the strips are then taken to the cutting or slicing machines. Here they are placed tightly packed one over another into a chamber about 7" to 10" high. Each of these machines has a kind of sharp guillotine knife fixed in a frame, which works up and down rapidly. As it goes sliding up and down, the compressed bundle of veneer strips is forced out to the required distance and is neatly sliced off. For the splints this distance is minute and is just enough to get them cut square; for the bottoms of the drawers it is 1", for the sides of drawers $\frac{5}{8}$ ", and for the box-covers 2 $\frac{1}{4}$ ". In the case of splints, the cutting machine has also attached to the inner side of the guillotine knife, and placed at right angles to it, five minute knives situated at equal distances apart from one another. At the same time, therefore, as the former slices through the compressed bundle of veneer sheets, the latter neatly sever the cut portions into six rows of splints about 2" long. It is believed that this machine needs the most careful attention, for it is not adjusted properly, the splints will not be cut square. To give an idea of how fast these machines work, if we take the sheet for the splints as $\frac{1}{2}$ of an inch thick, and the space in the chamber into which the sheets are compressed at 7", it will be seen that about 84 sheets are worked on at a time by the slicing machine. The little knives mentioned above divide these into six portions for the splints. Therefore, each time the guillotine works $84 \times 6 = 504$ splints are cut. The time taken by the knife to go up and down was not more than 4 seconds. So that in one minute one machine cuts about $504 \times 15 = 7,560$ splints.

These splints are then gathered up in baskets and taken to the drying rooms. Here they are placed in huge cylindrical drums (7' long \times 3' 8" diameter) with perforated walls. These are then railed into chambers heated by steam pipes, and during the heating, they are slowly revolved round and round. This is done for five hours, and it is said that by the end of that time the splints are thoroughly dried, cleaned and polished. From this

drying chamber they are then taken and placed into a sorting machine, which, by a shaking movement through a gauged sieve, rejects the broken bits. The splints are then neatly arranged in iron trays 2" x 14" x 2" and taken to the machines which provide them with their head composition.

There are five such continuous machines, and the ingenuity of their mechanism is absolutely bewildering and wonderful. The splints are gathered directly from the iron trays into a receptacle in the middle of the front of each of the machines. By a shaking movement, the splints are passed breadthwise from the said receptacle into the grooves of a sort of grill below it. The front ends of the splints lying in the groove project a little over the edge of the table, and whilst a pressure rail at the rear comes into play pressing against their other ends, the grill makes a forward movement and fees the splints into the holes of a large metal conveyor-platform, which keeps slowly moving. The end of each splint is thus firmly fixed in a hole in this platform, and as these holes are spaced apart a short distance from one another, the splints cannot touch each other. At first the splints stick out under the conveyor-platform, and in this position are transferred slowly by the moving platform over a heating arrangement to the paraffining apparatus, and then through the chocolate-coloured dipping solution. At the last named, each splint is furnished with its little spherical head, which is made of some igniting mixture, the chief ingredient of which is chlorate of potash. After this, the conveyor-platform passes round a drum, 42" in diameter situated at the rear of the machine. The treated splints are thus brought automatically on the upper side of the platform, which now looks like a gargantuan pincushion. In this position they are acted upon very efficaciously by a propellor fan, which, revolving over them at an enormous speed, helps to dry them. Continuing thus, the splints on the conveyor-platform arrive at the part of the machine and pass through a channel through which a second fan blows a blast of air, so that a complete drying of their heads is effected. The conveyor-platform then turns downwards once more near the front of the machine, and carries the finished and dried matches in front of the discharging apparatus, which pushes them out into a leather receptacle, from which they are carried to the machine which fills them into the boxes.

In the meantime in another apartment, the drawers and the box-covers are being made. For the construction of the former, the bottom and side pieces obtained direct from the slicing machines mentioned above are used, each kind being packed one over another in these drawer-making machines. The bottom pieces are put on a moving horizontal

platform and the side ones on a vertical descending one inside a tube. Inside a brass funnel near by the later is the paste, and on the left of the machine, wrapped up in a roll like a cinema film, is the blue paper cut to the required width. As the machines work, with clock work precision, the drawers are shot out from below beautifully and completely made. The newer kind of machines can make 50 drawers in a minute. In a similar machine the box-covers are made, 50 to the minute. All the above machines are worked by young Burmese girls, who have become thoroughly *au fait* in their manipulation. To see these drawers and box-covers being ejected so well and completely made, reminds one forcibly of the legendary machine where the pigs go in at one end and ready-made sausages and pig skin boots come out at the other.

The constructed drawers and boxes are then put on a large moving platform, which carries them to a chamber where they are dried for half an hour, and then conveyed to the filling machines. In each of these machines the box-covers are put in one tube, the finished splints in another and the drawers on a moving horizontal platform. The machines do the rest, and not only fill the requisite number of splints into each drawer, and push the filled drawer into a cover, but also by means of a pair of revolving circular brushes smear the two sides of the filled box with the dark-coloured substance for striking the matches on, the chief constituent of which is, it is believed, phosphorus. These field boxes are then dried for a short time in steam-heated chamber, after which they are carried to the machines which fasten the different kinds of labels on them. After this they are again dried for a short time, and are then taken to the last machines of all, which, not only make the familiar paper packets of ten books each, but also stick, on labels to each packet. It is believed that the output of each of these packing machines is 50 packets to the minute. The finished packets are then steam-dried as before and then packed for exportation. 120 packets are put into each tin case and six tin cases are put in each wooden box.

It will thus be seen that the whole of the manufacture of matches in Messrs. Lim Soo Hean and Company's factory is done by machinery. This machinery, it was noticed, was supplied by A. Roller and Company of Berlin, and to give the devil his due, to the inexperienced eye of the writer, it seemed to be extremely efficient and ingenious. It appears that a German engineer erected and managed at the beginning the machinery, and a German chemist worked out the formulæ for the different igniting and striking compositions for Messrs. Lim Soo Hean and Company. But since the advent of the war, or

possibly even before that time, the whole factory has been efficiently managed by a Burmese gentleman. The entire business speaks very well for the enterprise and business acumen of Messrs. Lim Soo Hean and Company. It is up to the general public, therefore, to give not only this firm, but also the other match-manufacturing firms in Mandalay, every encouragement by using their matches in preference to imported ones. If memory serves the writer right, the Viceroy, Lord Chelmsford, on his departure from Burma, took with him several cases of these locally made matches, and our late Lieutenant-Governor, Sir Harcourt Butler, ordered that these matches only should be used in Government House. It is also up to the Forest Department to give these firms all the help and advice they need. Both Letpan and Shawbyu flourish in places where no very valuable species can be grown. Also, both these species are soft wooded and quick growing. It will, therefore, be a moot question when funds and personnel permit, whether it will not be feasible to have plantations made of these two species and work them on short rotations.

PAPER TEXTILES IN CENTRAL EUROPE.

One of the most interesting of "ersatz" or substitute industries which have been developed in Central Europe, says the *Board of Trade Journal*, is that of so-called paper textiles. We have from time to time given details of the process by which paper fabrics are being made, and of the uses to which the products are being more or less successfully put. But the industry has not yet been surveyed as a whole in these columns, and an estimate made of its present size and possible future importance. The growth of this substitute industry has been very remarkable. Before the war it was experimental and comparatively trivial, curious rather than valuable. Under pressure of war's necessities, and of the shortage of cotton, jute and wool, it has expanded until many of the needs of the armies, and civil population of the Central Powers are supplied by means of it. It affords employment to numerous factories which without it must have been shut down, and it is to

no smaller extent taking the place of the spinning and weaving industries which before the war were occupied upon real textile fabrics.

GROWTH OF THE INDUSTRY.

Long before the war both Germany and Austria had invented methods of manufacturing yarn from paper and wood pulp (cellulose), but no great headway was made. Among these yarns the best known were "Textilose," a composition of paper and cotton waste, and "textilit," made of paper and flax or jute waste. But when the British blockade put restrictions on the import of fibrous materials, and such textiles as were available were requisitioned for Army purposes, inventors turned their attention to the manufacture of pure paper yarns, and produced them to a rapidly increasing extent. It appears that during the first 18 months of the war not much progress was made; no doubt manufacturers took some time before they realised the difficulties which they would be obliged to face. But once a start had been effected, the progress was remarkably rapid, and by the end of 1917 we learn that, whereas before the war there had been but two factories in Germany engaged in the production of paper yarn, there were then as many as 250. In Austria there are now said to be 300. It is somewhat difficult to make any precise estimate of the amount of paper yarn produced in the two countries, but there are reasons for believing that it must be somewhere between 200,000 and 300,000 tons per annum.

SUPPLIES OF PAPER PULP.

Such an out-turn could not be produced without seriously affecting the supplies of paper needed for other purposes, and the new industry must have contributed materially to the shortage of paper that was already sufficiently acute before this new demand sprang up. Not only so, but at the time when by the action of our blockade supplies of cotton were cut off, wood pulp was needed in large quantities to replace it in the manufacture of explosives, and the supplies of material for making printing papers were thus further reduced. To meet these increased demands, the resources of the Central Empires were much strained. As was to be expected, they greatly increased their imports of pulp from Sweden, and made strenuous efforts to obtain more paper for spinning, but difficulties in the way of financing their purchases limited the extent of the opportunities in this direction. They also turned their attention to increasing their production of pulp from their home-grown timber, which was by no means inconsiderable before the war, and have endeavoured for this purpose to exploit also the forests in the districts occupied by their invading armies.

VALUE AS A SUBSTITUTE.

The question of greatest interest is, how far this substitute industry is likely to fulfil the hopes entertained for it, whether it will continue its activities in the period of reconstruction, and whether it will be established as a permanency after the war is over. What we need is exact knowledge of the possibilities and limitations of the substitute industries that have been evolved by the war. Much will depend economically on the extent to which the Central Empires can render themselves independent of the textiles which the Allied Powers control.

Paper is not a substitute for wool; it may be used to a small extent to dilute wool in times of stress, but even the Germans hardly claim that this can be done on any but an insignificant scale.

Since the enemy occupation of the West of Russia flax and hemp have become less and less of a difficulty to Germany, and in any case typha would appear to be the war substitute for these fibres. Paper is not a satisfactory substitute for either, and even if it were it may well be doubted whether paper will be needed to supply the place of commodities that can be grown in large quantities on land at present under the domination of the German Army.

Whether paper can ever be a satisfactory substitute for cotton is at least doubtful. It is certainly true that paper is being used largely in German cotton mills for a variety of purposes for which cotton was formerly employed, and the German newspapers constantly claim that the difficulties in the way of producing strong, water-resisting, and at the same time fine and soft materials have been overcome, and that the use of paper as a substitute has been practically perfected. At the Berlin exhibition of fibre materials held in March of this year a large assortment of paper yarn fabrics was displayed. A few extracts from the catalogue will give a good idea of their diversity:—

"Heavy paper yarns, paper twines and padding thread," "Cellulose driving belts, conveyor belts, girths," "School knapsacks, market bags, shopping bags," "Skirts, petticoats, shirts, children's clothes, boy's ready-made linen," "Men's linen, collars, shirt fronts," "Mechanics' suits, towels, scrubbing cloths," "Caps and hats for men, women and children," "Corsets," "Washing blouses," "Bracis," "Paper sailcloth substitute, paper leather substitute," and so forth.

But in spite of the constant boasts of the excellent quality of the fabrics produced, it is probable that the attempts at manufacturing fine goods have not been successful. No doubt paper yarn is serving a useful purpose in providing a substitute material for many of the articles mentioned, such as workman's coarse clothes, etc., but so far no samples have been

received in this country of any of the finer goods, and until such samples have been seen and tested, it is impossible not to view the large claims of the German press with considerable scepticism. There have also been criticisms from German sources of the paper handkerchiefs and towels, etc., which are very dear and will not stand washing, and on the evidence available it seems a fair inference that the lack of cotton is at the present time a very serious hardship and handicap to our enemies, and that the control of supplies of this fibre after the war will be a valuable weapon in the hands of those who exercise it.

The case of jute is different. Although here, too, the boasts of the success with which paper substitutes for jute have met are no doubt exaggerated, and some of their defects may never be removed, there is little doubt that they have been very much improved since the war began. They have been usefully employed on a very large scale, and have solved, or at any rate greatly lessened, the difficulties that would otherwise have seriously hampered the Germans through the cutting off of their supplies of jute. Paper has achieved some measure of success as a substitute for jute, and that would seem to be its chief sphere of future utility.

THE PERIOD OF RECONSTRUCTION.

That the use of paper textiles will continue during the reconstruction period seems highly probable. It is not likely that at the close of the war there will be more than enough jute to replenish the stocks of the British and Allied manufacturers and to furnish them with quantities sufficient to last till the next crop is reaped. Even if the British Empire were to impose no restrictions on the purchase of jute for German and Austrian account, the use of jute in these countries would labour under a handicap. The landed price of jute must inevitably be abnormally high until freights have had time to recede from their present inflated level, and this price would be still further enhanced by the competition in the buying markets that must ensue if free access to them were allowed to the enemy manufacturers. In either case the need and the opportunity for the continuation of the substitute industry are manifest.

But whether the industry will survive the reconstruction period is more open to doubt, though there are at any rate some reasons for the belief that it will. The paper substitutes for jute have already improved, and it is only reasonable to suppose that further improvements will be evolved and that the inconvenience caused to our enemies by the lack of jute will grow less. Apart from this, it seems highly probable that the German Government, backed by the vested interests that

are being established, will do all in its power to foster the home industry and to establish it for all time. It should, however, be noted that the German Jute Merchants openly pronounce their fidelity to jute. In an article by the President of the War Committee of the Jute Merchants' Association it was stated that paper material will at best remain a poor substitute for the jute product. The article urged the necessity, from the German point of view, of considering, "by all available means, the unimpeded import of jute, jute material, and jute sacks." The opposition to the establishment of a large paper fabric industry in Germany may be illustrated by a memorandum from the Vereinigte Glanzstoffabriken, published in the "Berliner Tageblatt" of 8th August. This Association, which is chiefly interested in yarn made directly from cellulose warns the public against forming unduly optimistic expectations with reference to the possibilities of paper textiles, and states:—

Staple fibre, like artificial silk, is manufactured by means of a very complicated, long, and elaborate mechanical process, which requires long experience and involves very great difficulties for the factories which undertake it. It is, therefore, quite out of the question that hundreds of textile concerns should undertake the production of staple fibre, as widely suggested in the press. The granting of licences and erection of machinery would by no means be sufficient to make such extended production possible. Manufacturers who undertook the production of staple fibre would have to go through all the difficulties which the existing factories have overcome in the course of decades, and which the exertions of experienced specialists have taught them to avoid by means of improvements and special methods. The public cannot be too urgently warned to refrain from strengthening the demand for the granting of licences.

THE GENERAL UTILITY OF PAPER TEXTILES.

Seeing the extensive use to which Germany is putting her paper fabrics, and the prospects that the industry may have of flourishing after the war, the question arises whether these textile substitutes may have any value for the British Empire either now or hereafter. So far as their use in war-time is concerned, it would appear that they can have little value for us. In spite of tonnage difficulties, there is no need for us to replace our ordinary textile materials, especially as paper pulp also would need to be imported. To adapt our existing machinery to deal with paper would be a costly process, and it would take many months before the transformation could be effected on a scale large enough to make any appreciable difference. As a war

measure, then, the use of paper textiles does not offer any great attractions to us.

The importance of the substitute lies rather in the possibility that they may conceivably be improved and eventually developed into a menace to established British textile trades. For some purposes, indeed, the substitutes are already suitable, and it may be said that this menace even now exists. If, owing to dear freight, or other causes, the price of our raw materials rules high for some time after the war, an impetus might be given to the introduction of paper textile manufacture in neutral and allied countries. The cost-of production is obviously of very great importance, and there seems to be no reason why after the war wood pulp should not be produced cheaply. But even if the greater cost of true textiles should turn attention more and more to substitutes made from wood pulp, we need be under no great anxiety. We can use paper textiles if driven to it, and the timber resources of the British Empire are at least as great as those of the Central Powers.

ASSISTANCE TO BOMBAY INDUSTRIES.

The following statement was made in reply to a question at a recent meeting of the Bombay Legislative Council:—

(1) No financial assistance has been given by Government to the Indian Institute of Science during the years 1914 to 1918. In 1916 the institute applied for a grant (non-recurring) of Rs. 50,000 and a recurring grant of Rs. 9,000 in connection with the development of the fat and oil industries. Subsequently the director of the institute, reported that, owing to lack of essential plant the scheme could not be proceeded with. Government have received no future communication on the subject.

(2) In 1901 the Gujra Islam Match Factory was granted the sole supply of a particular kind of wood from certain Government forests at concession rates, and was also given a lease of land at favourable rates for a plantation of trees suitable for the trade. These concessions have been continued up to the current year.

(3) In 1917 Government sanctioned the grant of a supply of wood to the manager of the Southern Maratha Tile Works, Belgaum. In the same year a similar grant was made to the manager, Pioneer Clay Works, Belgaum.

(4) In 1917 the Eastern Trading Company applied for exemption from the payment of duty on the salt required by it for the manufacture of bleaching powder and caustic soda. The Company was informed that further application should be made when a site had been selected and the plans of the Company had matured.

(5) In the same year, Messrs. Kiroskar Brothers, manufacturers of agricultural implements, applied for what amounted to the grant of a monopoly for the supply of ploughs to the Agricultural Department. They were informed that the Agricultural Department would arrange for the disposal of as many of their implements as possible, but that no undertaking could be given that ploughs, etc., would not be purchased from other firms.

(6) In 1917, a manufacturer of hand-loom at Sholapur applied for a loan of Rs. 5,000 for the extension of his business. Government were unable to grant the request pending a decision of the general question of the grant of direct financial assistance to industries.

(7) In 1917 the Indigenous Industries Committee made certain proposals to Government for the development of the Rosha Oil Industry. Government have given assistance to the contractors by helping in the supply of certain plant and by the grant of a monopoly for the collection of grass in certain forest areas.

(8) In 1918 the Salsette Chemical Company applied for assistance in the importation of plant required for their operations. Government replied that it was not possible to give this particular form of assistance, and that if assistance of any other kind was required, the director of industries should be referred to.

(9) In addition to the above, during the past few years, Government have, on application, given assistance to various industries by the grant of land at favourable rates. Permission has been given to tap sweet toddy free of tax for the manufacture of gul, and the excise duty on denatured spirit of local manufacture has been removed. At the present moment the question of making considerable grants of timber for shipbuilding purposes is under consideration.

INDUSTRIES AFTER THE WAR.

In 1916 the Board of Trade appointed four Departmental Committees to consider respectively the position of the iron and steel, engineering, electrical, and textile trades after the war, especially in relation to international competition and to report what measures, if any, are necessary or desirable in order to safeguard that position. The chairmen of the several committees were: *Iron and Steel*—Mr. G. Scoby-Smith; *Engineering*—Sir Clarendon Golding Hyde; *Electrical*—the Hon. Sir Charles A. Parsons, K. C. B., F. R. S; *Textile*—Sir Henry Birchenough, K. C. M. G. All the committees finished their work by the middle of the following year, but their reports were not presented to Parliament until towards the close of last Session. They have since been issued to the public.

I.—IRON AND STEEL.

The Iron and Steel Trades Committee say that the problem of which they have attempted to reach a solution is to give the nation industrial resources which in time of peace shall preserve the prosperity of Great Britain, and in time of war give her full command of resources adequate to the defence and safe-keeping of the Empire. The committee specially refer to the rapid development of these two industries, which they describe as one of the most striking features of the economic history of the nineteenth century, and to the revolution caused by the discovery of the Thomas (Basic Bessemer) process. It was only in or about 1880 when the Thomas process was applied to the open hearth furnace, that basic steel attained comparative equality with acid steel, and not until ten years later that the admiralty and Lloyd's permitted the former to be used in shipbuilding. The manufacture of steel in the electric furnace is still in its infancy, but the process is gradually extending for the manufacture of high-grade steel and for the production of castings of special quality, and there is every reason to anticipate that steel so produced from domestic raw materials will, to a great extent, replace the steel formerly manufactured from imported Swedish iron and steel in the specialised manufactures of the country. While as regards the iron foundry industry there have been no "epoch-making discoveries," there is a record of steady progress in foundry practice and

of improvement in the quality of the product as well as an advance in the scientific education of those engaged in the industry.

The scope of the inquiry being very wide, the committee treated the numerous subjects separately, and from time to time made interim reports to the President of the Board of Trade. These are reproduced in the general report, the names of the signatories, with or without reservation, being appended to each. The summary of recommendations is grouped under various headings. Altogether there are sixty-one recommendations. The first six deal with commercial reconstruction, and are as follows:

(1) That all imports of manufactured or semi-manufactured products of iron and steel from present enemy countries be prohibited during the period of reconstruction; (2) that all ores and minerals necessary for the manufacture of iron and steel be admitted free, and all other materials necessary for the manufacture of iron and steel be admitted only in their natural or unworked state; (3) that no raw materials be sent to present enemy countries from British Dominions or Colonies, or from mineral or other resources under British control; (4) that British ships shall not carry raw materials or manufactured iron and steel from neutral ports to ports in present enemy countries or to neutral ports for ultimate despatch to enemy countries; (5) that careful Government consideration be given to the question as to whether the ships of present enemy countries shall be allowed to carry goods to or from ports in the British Empire; (6) that licences be granted in cases where national interests demand the relaxation of the regulations recommended above, and that a fully representative committee of the iron and steel industries be appointed to regulate the issue of such licences where they directly affect the industries.

The other recommendations include the following: That an organization be formed comprising users of iron ore, and others interested in and essential to the conduct of the trade, to undertake the import and distribution of foreign ores in Great Britain and acquire interests in ore properties abroad, and that such organization should receive Government financial assistance if necessary; that no mining concessions within the Empire be granted to any alien individual or company without Government sanction, and that the Dominions be urged to adopt a similar policy; that an adequate economic survey be made of the natural resources of Great Britain and other parts of the Empire; that iron and steel manufacturers associate themselves for the purposes of export trade, and form common selling organizations by the extension and consolidation of associations which already exist; that an organization—co-

operative in character—be formed among British manufacturers for the purpose of obtaining adequate supplies of suitable iron ore; that a national selling organization be formed for the purpose of marketing British iron and steel products in an efficient and economical manner, and that British iron and steel manufacturers be urged to form combinations for the purpose of laying down large and well-designed new units for cheap production upon modern lines.

Recommendations respecting labour relations, protection, royalties and wayleaves, means of transport, technical education, etc., follow.

Finally, general subsidiary questions are dealt with, and in this connection the committee recommend, *inter alia*, that where permission is given by H. M. Government for the raising of loans in the United Kingdom this permission be conditional upon the purchase of as much of the material required as possible in the United Kingdom, and that all purchases of iron or steel made by or for Government Departments, public bodies, railways, etc., within the United Kingdom shall be of British manufacture.

HOLKAR STATE INDUSTRIES.

Mr. M. V. Kibe in his third annual address to the Holkar State Industries Committee, held on 11th December last, spoke at length on the progress made in the State. He said:—

According to our usual custom we are meeting to-day at our annual function. Occasions like these give us an opportunity to review our work and to form our programme. For the first time last year, more than one meeting was held. I hope that meetings would be more frequent in the future.

The year which has passed has been of great importance to the department both in its losses and achievements. I have to record with deep regret the death of the two members of this Committee. The first to occur was that of Mr. S. R. Dube. His work is too well-known to you to need any deleniation by me. In him I have lost a subordinate who was of the greatest help to me both in the present and the prospect. He was followed by Sardar S. R. Vinchurkar, latterly Subhu of Nemad. He also took much interest in our work and was keen on finding opportunities for it. These two losses, the transfer of Mr. N. V. Phadke, to another office on promotion and the continued

vacancies in the posts of the Secretary for Commerce and Industry and the Secretary for Chamber of Commerce have been a weighty handicap on this department.

On the other hand I acknowledge the liberal help received by me from the higher quarters which enables me to lay before you a substantial account of work done. About a year and half ago, I had published a progress report of this department in which I had enumerated some specific schemes and had asked for some modification of the organization of the department. While no progress has been made in the latter direction, it is gratifying to find that the former, which could have very well taken a longer time, have been almost accomplished.

During a year and a half, the State has been pretty liberal in making grants for industrial progress. The first and the foremost in its significance is the grant of Rs. 5,500 placed at my disposal by His Highness the Maharaja, for investigation into and preliminary expenses for industries. This has been hitherto utilised less in capital expenditure than in advances, so as to utilise it as a permanent advance as far as possible. The other grants or loans, are enumerated below :—

- Rs. 5,000 Hosiery Factory.
- „ 20,000 Rotary Engines.
- „ 20,000 Wall-Tile Works.
- „ 50,000 House-Building Board.
- „ 20,000 Thymol Works.
- „ 20,000 Glass Factory.
- „ 90,000 Paper Factory.
- „ 16,000 Administrative sanction for a laboratory.

Proposals made for assisting a Cinema company, mainly devoted to educational films, an electric Workshop and a button factory have been held over for financial reasons. For similar reasons, the department has yet made no proposals regarding assistance to hand loom weavers at Rampura, Soap makers, a Coach factory, and two fine artisans who make enamelled ornamental wares. There are many other proposals tending to assist small industries which for the reasons already given, could not be hitherto entertained. It will be convenient for the department if a specific sum is annually placed at its disposal to promote such projects.

It is a criterion of the soundness of an undertaking that it should expand. Applying this test to the two concerns which on the assistance received from the State have carried on their work that they both claim for further funds to meet the requirements of their customers. While the hosiery factory has been regularly repaying its loan by the instalments fixed, in spite of the devastating influenza epidemic, the Director General of the Indian Medical Services

has given the following testimonial to the product of the Thymol Factory.

“The sample of the thymol submitted by you was examined and found to conform in many respects to the standard required by the British Pharmacopia.”

With a view to assist industries the duty on the import of coal has been abolished for the next seven years. The revision of the Tariff is under consideration in this connection.

Among the new projects that have been undertaken the foremost place is occupied by the appointment of Professor H. S. Jevons, Professor of Economics in the University of Allahabad, as the Economic Adviser to the State for a specified period. He has undertaken a thorough study of the economic development of the State and in the fullness of time the result of his labours and advice will be seen.

Professor P. Geddes, the town planning expert, has drawn up a plan for an industrial town, which will concentrate, co-ordinate and develop industries in the City of Indore.

One of the greatest and urgent needs is a broad gauge line. A scheme for it is being pushed forward and it is hoped that now that the War is over, one will be made at no distant date.

A cheap power is another necessity of industries. A scheme is under investigation, which while utilising such hydro-electric power as may be available, and for which investigation is actively going on, would make adequate electric power available for the present and future mechanical industries.

In connection with the project of levying a small super tax by means of the railways which has almost matured, a scheme for the development of the communications in the State and the neighbouring Country is being prepared. It will develop old ones and create new centres of trade, besides conferring other benefits on the trade.

The mineral resources of the State are receiving attention. Request for permission to prospect have been received from outside. Negotiations for working and mining certain ores have already far advanced. The attention of the local capitalist has not been drawn to these matters. The department can only try to find opportunities for the investment of their capital.

A proposal for the development of funds for the promotion of industries and general economic progress is receiving consideration and your opinions on it individually have been invited. A new annual income of over half a million will be made available for its purposes. Part of it has already accrued to the State during the last two years and proposals for the rest are maturing.

These proposals though meeting to some extent the need of a loan agency, cannot take the place of an industrial Bank. Much mis-conception prevails on the subject of a Bank. That one is a necessity for industries is undoubted but the subject is so shrouded in wrong ideas, that it cannot be dealt with at this place. The department is endeavouring to shortly meet this want.

But the feature, most gratifying to me, is the response we are meeting with from the people. Within the last two months two new companies have been formed with a capital amounting to Rs. 5,00,000. This includes the expansion of the private iron foundry to which reference was made in my last address. The Brush Factory requires more funds for its working. A Commercial and Industrial Bureau has been formed. A tannery on a big scale is projected by the Chemical Engineer, who has the work of the Paper Factory well in hand. The Geological Officer, who is looking after the Glass Factory, promises an economic Geology of the State and pottery works before June next. Several small industrial establishments have been started by the people and by the philanthropic merchants of the City. In the absence of an Act to register such associations, for which proposals have been made, such concerns stand in danger of dying a premature death.

I feel that in general very little is being done by the State by way of guiding and educating the people in trade and industries. The Chamber of Commerce has not yet been established. The project for a Technical School has not yet borne fruit. In this connection I append to this address a note drawn by me regarding the Industrial institutions started by the U. P. Government. It is disheartening to find that while the Mysore Government has taken up the idea of spreading the use of labour-saving machinery by establishing repairs shops in the country and appointing advisers in mechanical engineering, it has not attracted any attention here.

But the department with its limited means has not been quite negligent of its duty of spreading sound ideas and knowledge of trade and industries. It has collected a small museum of things made in the State. Reciprocity in the matter of publications has been established with corresponding departments of the Government of India, Provincial Governments and Native States. A few publications in the shape of bulletins, leaflets, and press notes have been issued. At the last meeting of the Committee a proposal to establish its branches in the districts was approved and has been forwarded for sanction. I would ask the Committee to consider the question of adding non-official members to it. A library of standard works and current literature is being formed. The commercial class has, mainly through the exertions of Mr. K. M. Banthia, B. Sc., B. Com., to whom I am grateful for it, continues to exist. Last year three students received its certificates. The department has now so far developed as to have a publication of its own. I wish to acknowledge the help which I have received from the editorial staff of the Malhari

Martand Vijaya, despite its recent ill-informed criticism, in the matter of the publication of the news and views of the department. A great stimulus to the publication department may be had from the electrification of the State Press, which has been recently accomplished.

At the last meeting of the Committee the proposals for holding an industrial exhibition and inviting a session of the Indian Industrial Conference were approved of and the questions were referred to a sub-committee. It has made its report which is under the consideration of the Government. The late influenza epidemic may adversely affect its prospects in the near future.

For the fuller development of commerce bonded warehouses at important railway stations, especially those on the borders of foreign states, will be highly useful. If a company were established for the purpose it may be assured of a good return on its capital.

The work of encouraging local as well as Indian industries would be greatly facilitated if a stores department, like the stationery stores, is created. In the latter as far as practicable such things were purchased, and the policy, it is hoped, will be continued.

The idea of appointing a special Forest exploitation officer has been taken up by the Governments of Mysore, Travancore and Cochin, with very beneficial results. British India fights shy of it and no progress has been made here. The Conservator of Forests, whose grass operations have made a name for him in India, takes keen interest in the matter and has lately sent in three reports describing certain experiments, which are available for your information.

The experience gained in the last two years has disclosed many needs, which are attempted to be met. A large sugar factory is under contemplation. Proposals for developing the scope of the distillery for making refined spirits have been made. A big Oil Pressing Mill can very well come into existence and negotiations for it are in progress. A metal factory is desired to be established. It is pleasing to note that applications for advice in the matter of starting new industries in the districts have begun to come.

Indore is a big market place for cotton. Owing to the stopping of the unrestricted cultivation of opium, cotton has become the next important commodity. Much speculation goes on in it. The raising of prices by its means detrimentally, affects the prospects of the Mill Industry at this centre. The matter has been investigated into and proposals for its control have been made.

With the starting of new joint-stock companies, and the participation of the people in the shares of outside companies, a share market is becoming a necessity. The publication of quotations of the local and some of foreign companies begun by the department will stimulate interest in the subject.

I have received the usual help from my staff which owing to diminution among its members and increased pressure of work on account of the famine and epidemic had to work harder than last year. It would be invidious to mention any names but Mr. V. G. Apte's name, whose services have been loaned to this department, may be mentioned. I am grateful to the Honorary Workers who have very kindly helped this department.

MYSORE ECONOMIC CONFERENCE AGRICULTURAL COMMITTEE.

Brief report of work done since September, 1918.

1. *Introductory*.—During the period under report activities were handicapped by the influenza epidemic, but current work received attention, and fair progress was also maintained on the schemes under operation.

2. *Fruit Culture*.—Detailed proposals were submitted to Government on the formation of District nurseries as a necessary first step for stimulating fruit gardening on a really large scale. The Committee were of opinion that private initiative should be encouraged as far as possible. A large demand for fruit plants has been created and it is quite necessary that local sources of supply should be organized to take advantage of it. A central nursery labours under obvious disabilities resulting from cost and difficulties of transport. An enterprising gentleman of Shimoga, Mr. Basappa of Holehanswadi, has offered to raise a nursery on his lands situated on the Banks of the Tunga not far from the District Head-quarters. Mr. Veene Rangaswami Iyengar of Seringapatam, a member of the Committee, has offered to start a similar nursery for the Mysore District. Recommendations have just been received regarding the loan of the services of an experienced mali to the Agent of the Murgi Matt, Chitaldrug, who proposes to start a nursery for that District. These proposals will be worked up and definite recommendations submitted to Government.

A book on fruit culture written by Mr. M. Subbayya, B.A., with special reference to local conditions has been published under the auspices of the Committee and has been made available for sale, through the agency of the District Committees.

A school for training malis has been sanctioned by Government at the instance of the Committee and steps are being taken to organize it and secure candidates for all districts.

3. *Live-stock*.—The Sheep Farm at Pilligana-halli (Gottagere) has been organized and our animals have been taken there. The institution has evoked much interest in the locality. The experiment with the Baluchi Dumbas has shown that they are hard to acclimatise, being very susceptible to changes of air and pasture and that we shall probably have to look elsewhere for a

cross strain. The experience with the Merino has, on the other hand, been encouraging and very promising young stock of mixed blood has been obtained.

The concessions recently sanctioned for the benefit of breeders have aroused a doubt in the minds of some officers as to whether these rules operate in supersession of the old rules regarding the supply of Amrut Mahal Bulls at concession rates, or whether they only supplement them. The subject is before the Committee for consideration.

4. *Increase of Food Production*.—The recommendation of the Committee for securing increased production by facilitating disposal of darkhasts and encouraging temporary cultivation of lands hitherto reserved from the plough, have been approved and embodied in Government orders. It has been ascertained from the Amrut Mahal Department that nearly 11,000 acres of land have been made available to the Revenue Department.

Continued touch is being maintained with the Central Foodstuffs Board at Delhi, as directed by Government.

5. *Agricultural Organization*.—The note drawn up laying down the constitution and the functions of Taluk Agricultural Associations is before the Committee for consideration. While agreeing with the views of the various District Committees that there is need for expansion of the Agricultural Department, the Committee consider that the paucity of staff makes practical action impossible at present.

6. *Statistics*.—Forms for the compilation of statistics of agricultural production have been prepared with a view to take stock of progress from year to year. A form intended to forecast agricultural development in extent as well as in quality has been approved by the Sub-Committee dealing with the subject.

7. *Development of Commercial Crops*.—Notes on facilities for developing sugar-cane and pepper cultivation by members of the Committee are under consideration. The introduction of indigo culture and manufacture on a commercial scale is under study.

8. *Agricultural Education*.—The scheme prepared by the Inspector-General of Education regarding the development of Agricultural Education by introducing agriculture, in the first instance, at thirty Anglo-Vernacular Schools in the State is under consideration along with suggestions received on the subject from members of the Committee.

N. RAMA RAO,
Secretary.

BOOKS IN BRIEF.

Towards Industrial Freedom. By Edward Carpenter. George Allen and Unwin Ltd., London. 3s. 6d. net.

Edward Carpenter is an idealist and as such is always a brilliant and fascinating writer to read. In this volume, which is for the most part made up of papers written before the War, he discusses with his usual versatility and suggestiveness problems as widely apart as the transformation of the British industrial system and the British Aristocracy and the House of Lords. Throughout the pages of the volume, however, there runs the same practical idealism that has marked as much his writings as his life itself. It is impossible to read this volume—as indeed any that Carpenter has produced—without feeling that he is the best type of what he describes as *spiritual* Socialism. "It becomes increasingly evident I think," he says, "that over and beyond any formulæ of reform what is needed is a new spirit of social and industrial life. Without that even the best institutions will be of little avail." And what is this spiritual Socialism? "This spiritual freedom means," he adds, "the opportunity to evolve from oneself what one thinks right and beautiful. It means a co-operation of all the members of Society, and this in a way not merely technical and external, but in a real spirit of mutual help and equality. Only on such conditions, we may be sure—only on the condition of spiritual and creative freedom—can a society be really human and healthy." He illustrates his point by adding a chapter on Chinese life, in which he compares its simplicity and spirituality with the conditions prevailing in Western countries. Campbell has illustrated in his own life the need for increasing agricultural produce; his theory has been demonstrated to be something more than a mere dictum. The War has shown how England has suffered by the neglect of agriculture that she suffered to continue during the past century. Campbell believes in small holdings and holds that a nation that calculates its prosperity on the length of its rent roll is not even a civilized one. This may look an extreme doctrine but is grounded in conviction so far as he is concerned. His comparison between China and England in this matter is rather worth quoting to show how he views this question. "In China," he writes, "it is thought rather disgraceful to live on the rent of land. There is no law, as I understand, against it, but there is a strong public opinion and though, as a matter of convenience, it is not uncommon for

one small holder who has more than he wants to rent out an acre or two to another who has less, it is rarely for any one to attempt or dare to live entirely from the tribute of his tenants. In England, I need hardly remark, it is just the opposite; there is a common public opinion in the other direction, and a man is respected, and even thinks himself respectable, just in proportion to the rent-roll. Apart then from all legislation, one can see in these two instances the vastly differing results of a differing spirit of life—in China an immense peasant-class rooted comfortably in small tenures on the land, the most productive and the most stable on the whole Earth, and in England huge private estates half cultivated by a paralysed and insufficient population, and a country in perpetual danger on account of the inadequacy of its food-supply." One who writes thus cannot but be an admirer of small holdings and agricultural co-operation. "In my experience," he writes, "small holders are among the best and most capable of our rural populations." (He includes as small holders those who work farms up to forty acres or so). "They generally exhibit," he adds, "a good deal of all-round capacity, and are versatile and handy at a variety of jobs. And this for the simple reason that having to look after a small place mainly by themselves they are obliged to be a little ingenious and versatile." He would transfer the main portion of the common lands into public hands by a statutory enactment; and he would also by another measure compel owners in the future to declare their land values, and enable public bodies to purchase on the basis of the values so declared. These two measures, in his opinion, would bring "the land of the nation into the possession of its rightful owners." That something of this sort is being brought into existence as one of the results of the War few can deny in the light of what is actually happening to-day in England. Carpenter may be a dreamer—and he has been described as such—but that he has dreamed aright in certain directions there can be no denying. This book is full of the suggestive writing that readers have long associated with Carpenter's name. Good wine needs no bush and Carpenter's writings do not need any commendation at our hands.

The Renaissance in India and New Ways in English Literature.—By J. H. Cousins. Published by Messrs. Ganesh & Co. Madras.

Our excuse in reviewing these books by Mr. Cousins in this *Journal* is that they are something beyond the merely literary criticism that we usually get in volumes of this kind. Mr. Cousins is a gifted poet; a writer with a style; and no mean critic.

Besides, he has in his life time apparently come across some literary personages of eminence. His impressions of these he records in these volumes and these alone would make them highly valuable. One such person of worth is Edward Carpenter of whom we have written above. Mr. Carpenter is described by Mr. Cousins in the second of the two books noted above. His word picture of the old Socialist seer is a brilliant one. It is one that every one who wants to know something of the causes which have made Carpenter what he is should read it for himself. For ourselves we have read much by Carpenter but little of him. This is the first time we have had anything like a satisfactory account of the man and the influences that have made him what he is to-day. Some body called Carpenter a "dreamer": whether he or his critic is the real dreamer can be easily understood by any one who reads Mr. Cousins' essay. To the student of Economics, this essay, by the way, will prove of peculiar interest. We know that there are phases of thought far too characteristically Eastern (or rather Indian-and Upanishadic) to be perceived in a twentieth century Western thinker like Carpenter. Until we read Mr. Cousins we had no idea that Carpenter had studied and profited from the *Gita*. We think we have written enough though only on one aspect of Mr. Cousins' writings to show their real worth. We think no one who reads Mr. Cousins will ever lose an opportunity of renewing his acquaintance with him. He is a most delightful writer and it is a pleasure to read him. We do not think we need say more in commendation of him or his writings.

The Co-operative Movement. By V. Venkatasubbiya and V. L. Mehta. Published by the Servants of India Society, Allahabad.

This is a clearly written book and as such deserves to be widely read. In the first part, Mr. Venkatasubbiya discusses the general principles of co-operative movement in European countries and India. In the second part, Mr. Mehta deals with the different forms of Co-operation known to India—Agricultural Credit Societies, Non-agricultural Societies, Non-credit co-operation, etc. He has also chapters on Central Societies and Banks, State aid and control and organization, supervision and audit. We have given these details to show the comprehensive character of this book. It is throughout written with care and the figures are up-to-date and accurate. We would gladly see the book attain the popularity that it so richly deserves.

How to Pay for the War.—By Harold Hamel Smith, Editor, 'Tropical Life.' Published by John Bale, Sons and Danielsson, Ltd., Oxford House, London: W. 1.

Mr. Hamel Smith is not unknown to our readers. His contributions to this *Journal*—which have been, by the way, extracted in this book—should have made him fairly familiar to them. He is so fertile a writer and so suggestive in his schemes that anything he writes about ought to appeal to a large number of thinking men all over the tropical world. Mr. Smith in this book has ventured to show on what lines the latent resources of the Empire can best be developed and how such development can aid the Empire as much as England herself. Mr. Smith does not expect every one to agree with him but he certainly expects a fair hearing. We know that he will secure this despite the unpopularity of his views. We do not propose to go into the details of his book

for that would be unjust not so much to Mr. Smith as to his publishers, for they have a right to get full value for their expenditure on it, especially in these days of paper famine. But we must, we feel, refer to one or two points touched upon in it. One is the important place assigned to it by him for India. His chapter on "Develop India" is a reprint of his article in this *Journal*. It is a thoroughly sane one. Another subject he discusses is why we should prevent Germany obtaining the bulk of her wealth by being carried on the back of the British Empire. A still another topic that Mr. Smith discusses on is why we must increase the output per worker per annum and also per acre in use by employing up-to-date measures and machinery. Mr. Smith's book is, as usual, thoroughly readable and we have no doubt it will be appreciated everywhere in the tropics for its suggestiveness and sanity.

The Expansion of British India. 1818-1858. By G. Anderson, M. A. and Mr. Subedar, B.A., B.Sc., F.R.S.E. Published by G. Bell & Sons, Bombay and London. Price 4s. 6d. net.

This is a most laudable attempt to get the student accustomed to the first authorities on Indian history. It is what is popularly termed a "Source Book." On the whole the authors have done their work with scrupulous care and attention. The period dealt with is a most important one and is dealt with in a thoroughly comprehensive spirit. Perhaps the value of a publication of this kind would be enhanced a great deal more if the authors went straight to the fountain heads rather than to the distributories. This may not be always easy but while at it, it seems right to seriously attempt it. We would strongly commend the book to the attention of our University Board of Studies. We await with interest the future volumes of this series.

The Business of Finance. By Hartley Withers. Published by John Murray. 6s. net.

This is a most suggestive book by Mr. Hartley Withers. He writes with his usual vivacity, and this is the best recommendation that a book on finance can ever want. It is what such a book is usually *not*. There is no crude sentimentality in it; rather many old shibboleths are pricked through by Mr. Withers by the piquancy of his criticism. We shall only refer to one point which he refers to in his book to indicate the perspicacity that is so much usually in evidence in Mr. Withers' writings. In the chapter on "the manufacture and marketing of Securities", Mr. Withers has a word or two on preference and preference Securities. These are wise words and those interested in them ought to lay his words to their hearts. We would also refer before we conclude to his very luminous remarks on international currency and investment abroad. They will amply repay perusal. We cannot, we think, better sum up his book than in his own brief words. He says: "I have tried to show how important it is that the machinery of finance should be kept clean and handled by men with clean hands and minds, fitted always with the wish to use it for the improvement of man's lot, and the expansion of his power over the forces of nature. Many difficulties have been shown to be in the way of the fulfilment of this ideal, most of which are seen to arise out of the ignorance and greed of an economically uneducated public, which continually invites sharks to prey on it, and then blames finance, and those who try to work it honestly, because its invitation is accepted."

Making Advertising Pay. By Harold F. Eldridge. Advertising Manager. "The State." Columbia, S. C. Published by the Author.

"The study of advertising, says Mr. Eldridge in the preface to this book, "from an economic and social standpoint reveals the fact that when properly directed it becomes a force which benefits both the advertiser and the consumer of advertised goods, justifying its economic existence by the service it renders to both." These are wise words and are the results of his wide experience in the advertising line. The present reviewer has been long connected in the management of newspaper offices and he can say that much of the advertising that is in done in this country—apparently it is so even in the far away Western country from where Mr. Eldridge writes—hardly ever bears the fruit it should; if well directed why should this be so? That question Mr. Eldridge answers in this book from his close acquaintance with practical advertising. His conclusion that advertising will not pay unless it is clearly understood what it is. There is not, in his opinion, is that appreciation of the true function of advertising as there should be. This diagnosis is, we think, correct. If there were some clear idea of its true value, there would be less waste of it. Mr. Eldridge writes with wide knowledge of advertisers and advertisements, and enhances the value of his book by basing it mainly on records of actual accomplishments and experiences. This is as it should be. To those interested in advertising in this country—and they ought to increase with the coming of peace—we would strongly recommend a careful study of this book. It is scientifically cast and treats of the fundamental principles of advertising in a manner which leaves nothing to be desired.

India under Experiment. By George M. Chesney. Published by John Murray. 5s. net.

This is a critical examination of the Government scheme of political reform in India. Mr. Chesney was for long Editor of the well-known newspaper *The Pioneer*. His views, though more destructive than constructive, ought to command wide attention. It is often advantageous to know what your opponents think of your proposals and in that light Mr. Chesney's criticism will lose none of its weight because it is either too vigorous or pungent. Few of those who knew Mr. Chesney in India would ever have thought that he would develop so much pugnacity as he betrays in this book of his, but as has been well remarked the busy newspaper man is the best type of fighting politician the world knows. Mr. Chesney's criticism we do not propose either to detail or examine here for the reason that it is likely to lose its force in retailing. Every one should read the book for himself to judge of its merits.

In the article on "Co-operation in Bombay" in the October (1918) issue of this *Journal*, the report considered was the one for 1916—1917 and not that for 1917-18 as appeared in the head note to it. In the same article on page 617 col. 1., line 10, the word "but" should be "not"; on p. 169, Col. 2, line 9 the word "pushed" should be "has had" on p. 620, Col. 1, line 39, the word "instructive"; should be "initiative"; and on p. 621, Col. 1., line 40, the word "drawing" should be "driving." We would thank our readers to note these printers' errors in their copies.

ACKNOWLEDGMENTS.

Report on the Administration of Mysore for the year 1917-18. Bangalore. Printed at the Government Press. 1918. Price One Rupee.

Some Scale Insect Pests of Coffee in South India. By Leslie C. Coleman, M.A., Ph.D., and K. Kunhi Kannan, M.A., F.E.S. Department of Agriculture, Mysore State. 1918. Price One Rupee.

Proceedings of the Eighth Conference of Registrars of Co-operative Societies. With Appendix. Printed at the Government Monotype Press, Simla. 1918.

Kheti and Sahakarya Trimasik. Baroda. Department of Commerce. Baroda State.

RECENT PUBLICATIONS.

School and Home Gardening. By Kary Cadmus Davis. 7½×5. xvii, + 353 pp. Lippincott.

Self Training. The lines of mental progress. By H. Ernest Hunt. 7½×5, 240 pp. Pidon. 4s. 6d. n.

The Economic History of Ireland in the Eighteenth Century. By George O'Brien. 8¾×5½, 446 pp. Maunsell. 10s. 6d. n.

The Teacher in Politics. By Sidney Webb. 8¾×5½, 15 pp. The Fabian Society. 2d.

The New Tariffism. By the Rt. Hon. J. M. Robertson, M.P. 7½×4½, 62 pp. Allen and Unwin. 2s. 6d. n.

The Applications of Electrolysis in Chemical Industry. By Arthur J. Hale, Demonstrator and Lecturer in Chemistry, the City and Guilds of London Technical College, Finsbury. (Monographs on Industrial Chemistry. Edited by Sir Edward Thorpe, F.R.S.) 9×5½, ix, + 148 pp. Longmans. 7s. 6d. n.

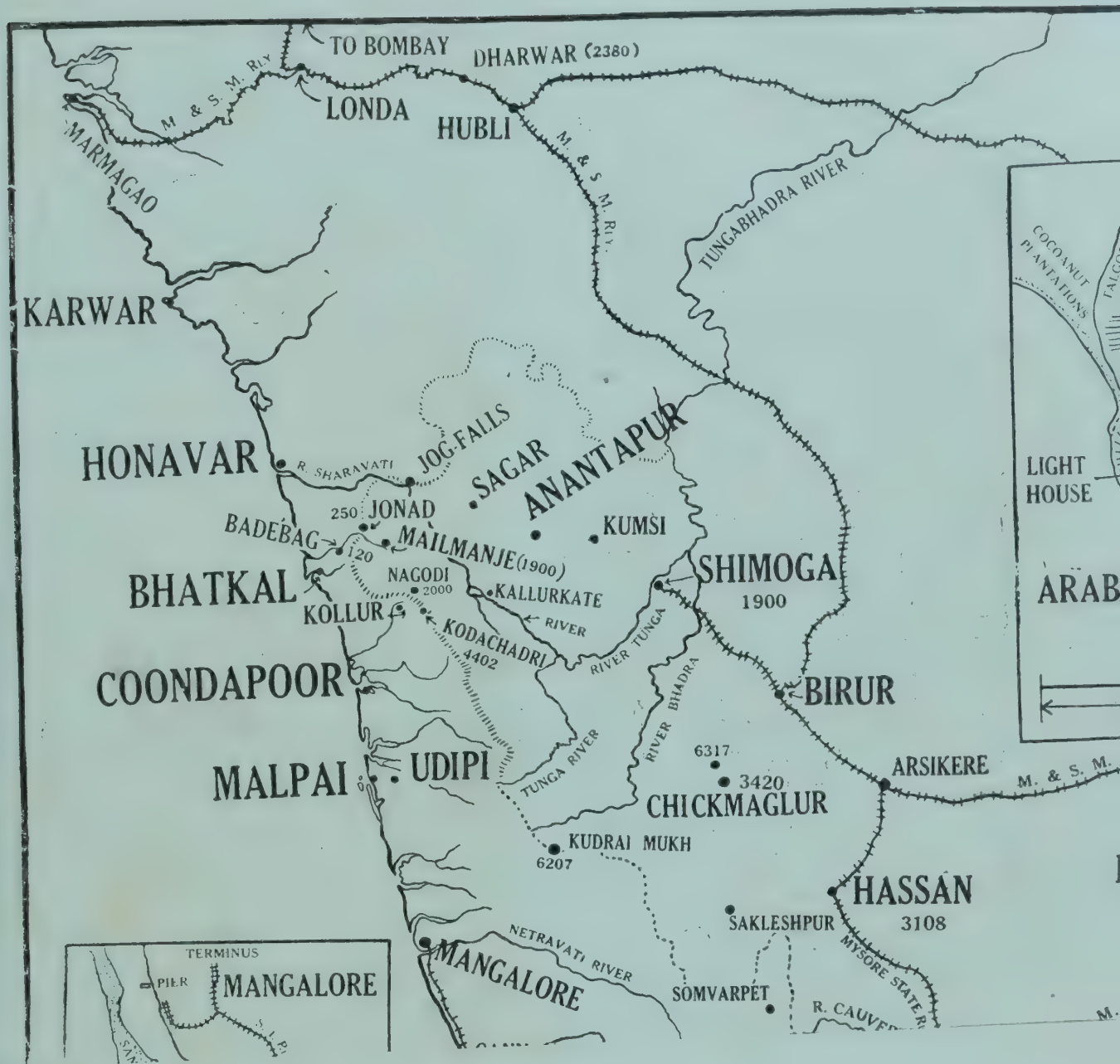
The Trust Problem. By Jeremiah Whipple Jenks, Research Professor of Government business New York University. Fourth Edition. Enlarged and completely revised. With the Collaboration of Walter E. Clark, Professor of Economics, College of the City of New York, President of the University of Nevada. 8¾×5½, vii, + 499 pp. Putnams. 10s. 6d. n.

Fuel Economy in Cooking Apparatus. By Arthur H. Barker. 11×8½, 27 pp. The Builder. 1s. 6d. n.

Comparative Education. Studies of the Educational Systems of Six Modern Nations. By H. W. Foght, A. H. Hope, I. L. Kandel, W. Russel, Peter Sandford. 8¾×5½, x, + 500 pp. J. M. Dent. 8s. 6d. n.

Human Nature and its Remaking. By William Ernest Hocking. 9×6, xiv, + 434 pp. Humphrey Milford. 12s. 6d. n.

The Industrial League Journal. No. 1. Vol. I. September, 1918. 10×8. 12 pp. The Industrial League. 6d.



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MODERN EDUCATIONAL IDEALS.*

BY FRANK NOYCE, I.C.S.

NEVER in English History has so great an interest been taken in educational questions as is the case to-day. The war has revealed many of the weak joints in our armour and in education as in other spheres, there is much that the nation is bent on remedying and that right speedily. For this reason, as Lord Bryce says in the introduction to this deeply interesting volume of essays, there is special need at the present time for the re-statement and enforcement by argument of sound educational principles. Dr. Benson has collected the views of eleven prominent educationalists, almost all of whom are either head-masters or ex-head-masters of English public schools. It must be admitted that it is a defect in the book that it deals too exclusively with secondary education and that it is confined almost entirely to the education of boys. It would have been more complete and, possibly, even more interesting if the views of some head-mistresses had been included as well as those of Cambridge graduates with experience of primary school education. There are many such. Mathew Arnold was an Inspector of

elementary schools. None the less, the fundamental principles of education remain the same, be the schools primary or secondary, in England or in India.

A volume of essays by different hands, more especially when they deal with such a thorny subject as education, is not an easy book to review briefly. In the one before us, there is, however, a striking consistency of treatment throughout. The author's pleas for the education of the future fall under three main heads.

The first of these is that education should be interesting. As one of the essayists says, there is a theory still widely held amongst teachers that the value of a subject or of a method of instruction depends upon the amount of drudgery which it involves or the degree of repulsion which it excites. History and geography have consisted of nothing more than the memorising of dull and unrelated facts. The ordinary school boy does not realize that history can be as good reading as a novel until—probably out of school hours—he lights upon the pages of Macaulay. The classics, Dr. Benson asserts, are made unattractive by the method of giving such short snippets and by insisting on what used to be called thorough parsing. Even *Alice in Wonderland*, he adds, could only prove a thoroughly bewildering book, if read at the rate of twenty lines a lesson and if the principal tenses of all the verbs had to be repeated correctly. This applies not only to the teaching of the classics but also to that of modern languages. It is essential in the case of both, if

Cambridge Essays on Education. Edited by A. C. Benson, C.V.O., LL.D., Master of Magdalene College. With an introduction by the Right Hon. Viscount Bryce, O. M. Cambridge University Press.

any genuine love of literature is to be aroused, that something should be read fast enough to give some sense of continuity and range and horizon. Guessing at the meaning of words instead of being punished should be encouraged. It is, in reality, far better mental discipline than turning over the pages of dictionary. The use of translations, provided they are good ones, and the wretched "cribs" of one's own school-boy days is not to be deprecated. Grammar should be dropped as a subject of special study. All that is necessary can be picked up by the way.

The second plea is that education should be general and not specialized. A good all round education is far more valuable than the vocational—or thoroughly practical—education that many parents were demanding a short time ago. Specialization ought not to begin until a comparatively late stage in a boy's career. The evils of premature specialization are increased rather than diminished if that premature specialization is vocational. Sir John McClure, Headmaster of Mill Hill School, illustrates this point by a quotation from a recent article by Professor Leacock on the movement in Canada some twenty years ago for a "thoroughly practical education in schools and universities." The railroad magnate, the corporation manager, the multiform director and all the rest of the group known as captains of industry, began to besiege the universities clamouring for practical training for their sons. Mr. Leacock inspected "one great and famous Canadian school" at which practical banking was taught so resolutely that they had wire gratings and little wickets, books labelled with the utmost correctness and all manner of real looking things. It all came to an end, and now it appears that in Canada they are beginning to find that the great thing is to give a school-boy a mind that will do anything; when the time comes, "you will train your bankers in a bank." It may be

that everybody has not recognized this, and that the railroad magnates and the rest of them are not yet fully convinced; but Mr. Leacock declares that the most successful schools of commerce will not now attempt to teach the mechanism of business, because the solid orthodox studies of the university programme, taken in suitable selective groups offer the most practical training in regard to intellectual equipment that the world has yet devised." Two of the writers, Dr. Inge and Dr. Bateson, pleaded for a greater recognition of the place of science in education. Dr. Inge does so with no little eloquence. It seems to him that, as an instrument of mind training, and even of liberal education, science has a far higher value than is usually conceded to it by humanists. Dr. Bateson is not very hopeful about the future of science in education and there is a somewhat acid flavour about his essay which is absent from the rest of the book. In his opinion, the utmost limit of success which conditions admit is some inoculation of scientific interest and ideas upon the susceptible members of the talking classes, the politician, the lawyer, and the journalist, who assume the leadership of the country because they have a special gift, which under the conditions of democratic government, has a prodigious opportunity.

If education is to be complete, one subject which it must include in addition to science and the humanities, is citizenship. So holds Mr. Mansbridge, the founder of the Workers' Educational Association, which has done such sterling work in the development of citizenship in and through education pursued in common by university and working men and whose activities have, it is to be hoped, been only temporarily interrupted by the war. The study of civic relations in schools has been developed to a much greater extent in America than in England probably because the American need, owing to the constant influx of people of different nationalities to the United States, has been

more obvious. None the less something has been done in England, both directly and indirectly. Such movements as boys' brigades, boy scouts, girl guides and Church lads' brigades are all, in their several ways, doing much to develop citizenship.

The third plea is that education should be more individualistic than it has been in the past; both in and out of school. It should not be the clever boy alone who receives attention but the bent of each boy's mind should be studied and developed. In school, for example, the creative instinct which is seldom absent even in the dullest boy, should be fostered. Boys should be encouraged to write poems, stories or essays of their own. Out of school, ample time should be given them for the cultivation of their hobbies. Mr. Malim, the Headmaster of Haileybury, has some wise observations on the proper place of games. Whilst he admits their importance in developing the qualities of physical courage, self-control, endurance, public spirit, fair play and leadership, he points out that an unwilling player never makes a good player. Cricket, he somewhat sorrowfully admits, means a serious waste of time in many cases. The summer half holidays are emphatically the time for hobbies and it is a serious charge against games if they are developed to such a pitch that hobbies are practically prohibited. Mr. Badley, the Headmaster of Bedales School, urges that expeditions in pursuit of outdoor interests, such as natural history or archæology, should be an alternative to games or compulsory for those who have not an equivalent hobby. He has many practical suggestions to make regarding the right use of leisure indoors both in the pursuit of intellectual interests and in various kinds of handicrafts.

If education is to be on the lines sketched in this volume, of whose contents it has been possible to give only a very imperfect sketch, it is obvious that the ranks of the

teaching profession must be recruited from the very best men. There can be no doubt that this has not been the case in the past. Far too many men have taken up teaching on leaving the universities not from a sense of vocation but because nothing else seemed open to them as they had not the means to wait until a practice at the Bar or in medicine came to them. The prospects of a career and the chances of obtaining distinction in the teaching profession have been too few to attract men of ability and ambition in adequate number. Mr. Roscoe, the Secretary of the Teachers Registration Council, the genesis of which he describes in the last essay in the book, sees in that Council the dawn of better things. He considers that it furnishes the framework of a possible teaching profession and gives promise of securing for teachers a definite status by establishing a standard of attainment and qualification.

We cannot better conclude than by quoting Mr. Paton's summing up of the aim of educational reform. "England is looking to her schools as she never did before. The aim of her education must be both high and wide, higher than lucre, wider than the nation and the aim of our education cannot be fulfilled until the education of other peoples is infused with the same spirit. Education like finance must be planned on international lines by international consensus with a view to world peace. Only so can it fulfil the ultimate end which already looms on the horizon.

Becoming when the time has birth

A lever to uplift the earth

And roll it on another course."

THE HOUSING OF THE POOREST.

BY PATRICK ABERCROMBIE, M.A.

ONE of the most difficult aspects of the post-war Reconstruction Problem will be the "Housing of the Poorest," a phrase which usually includes dealing with the insanitary property that exists in nearly every town and is scattered throughout the country. It is only in this lowest scale of the Housing question that demolition bulks so largely; for though many people would like to see acres of our dreary and respectable suburbs swept away, this is perhaps too visionary an ideal, and the most we can do is to organize the provision of more attractive houses and surroundings in the hope that by degrees the "bye-law" suburb will have become so unpopular that no one will live in it and the proprietors will be forced to rebuild or have their houses empty.

But the Slum, where the poorest are housed, is another thing; we cannot wait for a similar natural process to get rid of it; for it has become a pressing question of Public Health and its continuance is as dangerous to the community as the sale of tainted milk or diseased meat. It is, of course, but natural that the only section of the community which is unable to pay an economic rent should find itself living in buildings whose vigorous life is ended, but whose worthless old age has been prolonged into a senile and miserable dotage. Thus in the past, private enterprise, which has built 95 per cent of the houses of the country, has left the "Poorest" severely alone, and what little has been done is due to private philanthropy and public authorities acting as custodians of public health.

But a policy which begins with destruction is necessarily less attractive, more complicated and more costly than one which is

Constructive from the start; attention is inevitably focussed on the providing of new houses, and these situated on the outskirts, where land is not complicated by having already been developed. Again, some of the tendencies that appear most promising and hopeful for future urban growth, tell against the slum problem. It is recognised that the soundest means of getting rid of slum areas is not by converting them into new residential quarters, but through the commercial and industrial growth of a town rendering their clearance an economic necessity; this is manifestly what is about to happen in the Don valley, where are the heavy steel works of Sheffield and where slum dwellings occupy some of the finest factory sites in the world. But against this is the present tendency (admirable in all other respects) towards decentralisation of industry, greatly about to be stimulated by a National Supply of Electric power, available on trunk lines through open country. This will naturally make slumland in existing towns less required; and the lofty building of shopping stores and the vertical growth of business premises tend to prevent the central business area from spreading into its inevitable ring of decayed residential property which has grown into our slums.

But in spite of its complexity and the greater attractiveness of other aspects of housing Reform, a country bent upon the Reconstruction of its national health cannot afford to neglect the Poorest and their hovels, whether in town or country. If ordinary and comparatively healthy Town conditions produce an inferior physique to the modern Garden Village, how much less likely are the frankly unhealthy surroundings of the slums to produce a race capable of making up the wastage of the war? In a paper read some years ago before the Royal Sanitary Institute, Dr. G. W. Eustace clearly demonstrated the effect of Hygiene upon the wage earning capacity of the People; and it is perhaps worth while

recalling the comparison of weights of boys between the ages of six and fifteen in two schools, one at Port Sunlight and the other at a Liverpool Council School; starting with a fairly similar weight of 44 lbs. (Port Sunlight) and 38 lbs. (Liverpool) at the age of six, we find the difference slightly increased at 13 from 80 to 68, more marked at 14 with 105 lbs. against 75 lbs. and most notable at 15, the difference being 107 lbs. and 64 lbs; from this latter figure it will be seen that the Liverpool boy actually begins to *lose weight* at the very moment that he approaches a wage earning age. A similar contrast between the two Schools was obtained in heights. It must be remembered that the Liverpool School was not attended by slum children, but by those of the labouring class, whose parents have constant employment. It is difficult to say exactly how many people at present inhabit slums, as this term is too vague for accurate definition; but it is somewhere near the mark to say that between 5 and 10 per cent of our working-class population at present live in houses unfit for human habitation. This state of affairs with its natural consequence of high infant mortality and poor physique is one the nation simply cannot afford to allow to continue.

It may be well to enquire how it is that after all these years of Housing Reform effort, and in spite of the help of various Housing Acts, we are still faced with this unsolved problem. Have the Local Authorities not done their duty, or has the Local Government Board exercised insufficient vigilance? The answer may perhaps be given in a sentence; a national obligation has been handed over to be paid for by local funds; and the work has proved too costly for all but a few extremely courageous authorities. Again, it has not been sufficiently recognised that to demolish insanitary property is not sufficient; as the poorest are unable to pay an economic rent and are thus unacceptable as tenants to private enterprise,

they have crowded into the surrounding houses, producing new slums to take the place of those demolished.

The experience of Liverpool is of great value, as this city has attempted more completely than any other to solve the three-fold problem of destruction of unsanitary property; prevention of consequent overcrowding in surrounding property; and the rehousing of those dispossessed. In 1864 there were in the town 22,000, insanitary houses of the vilest description, containing a population of over 100,000 people. From that year the Corporation began demolishing these buildings and by 1894, 40,000 persons had been uprooted. The land so obtained if not left vacant, was either sold off for building purposes or the Corporation itself built houses; but in all re-building an economic proposition was carried out, with the consequence that none of these uprooted persons had been rehoused, and new slums were being created to the destruction of better neighbourhoods: thirty years of energetic work had merely aggravated the disease and there was a strong feeling in some quarters that the work had better cease. Instead, the Housing Committee embarked upon an entirely new policy, namely, that the new schemes should be devised so as to house those persons who had been turned out of the insanitary property, and the rents kept within their reach, whether the scheme paid or no. The result has been an entire success—in one instance 99 per cent of the dispossessed are living in the new houses; the mortality rate of those concerned has fallen from 50 to 27 per thousand; the decrease in crime is no less striking, the figures according to the report of the Chief Constable in 1910 "indicating real personal regeneration."

But the cost has been enormous; the rehousing of 8,000 people produces a loss of £22,000 per year or £2-15s. a head, apart from the cost of demolition and clearance; and this may be taken as an average (based

on pre-war figures) of what it will cost the nation to rehouse on *similar* lines, the whole section of the population that is living in unsanitary houses.

But before dealing with the possibility of a different financial aspect of the work, it is necessary to point out that there is an alternative to the Liverpool method of rehousing on practically the same spot. It has been frequently suggested that these people might be taken to the outskirts and cheap land developed for them there. The difficulty of their casual dock work, as in Liverpool, has been met at Antwerp by means of a telephone labour bureau and cheap fares; the labourer, if no work be forthcoming, is thus able to spend a profitable day in the garden. But while it should be possible to offer a dispossessed tenant the chance of living on equally easy financial terms on the outskirts, it is not likely that many avail themselves of it in the great cities; they have, as has been truly said, their own schools, their own churches, their own associations, which a great many are very desirous of retaining; human beings cannot be treated like cattle, driven to pastures new, whenever their beneficent guardians consider their health requires it. At the same time, customs change in a single generation—and the gardening habit, stimulated as it has been by the war, may draw out of the centre the children of those who prefer to live in the clean and airy tenements provided by the Corporation in the heart of the city.

Other suggestions have been put forward—but they are of little worth—thus some people have advocated the system of general post, in which new houses on the outskirts are built for the better-off labouring classes, the worst houses destroyed, and a move up anticipated all round: but though plausible, this is a thoroughly bad policy; the poorest, if they are to leave their slums, should move into *new* buildings especially designed and as sanitarily finished as a hospital—to suggest that they should occupy houses a shade

less frousy than those they have left, is to hold out no helping hand for their regeneration. It is also impossible to trust to a natural redistribution, which would merely lead to a further creation of slums. Nor can the proposal put forward by the Urban Land Report be recommended; namely that the Corporation might purchase the cheapest *habitable* houses (vacated through the general post) and if necessary renovate them. People who have been unaccustomed to live in decent houses and who have lost the habit of cleanliness require something more definitely new, the last word in scientific construction and convenient labour saving arrangement. What Dostoiéffski calls “the poor people’s smell” should be impossible in the new houses.

What, then, is the policy which the Nation must adopt in order to eliminate this wastage of energy and life? Firstly, the whole question of the Housing of the Poorest must be considered as a Health Proposition and be dealt with by the Ministry of Health, as one of its most urgent functions.

A Survey at once should be instituted, in order to discover, without any blinking of fact, how many unsanitary houses there are in the whole country, and the nature of their unsanitariness—whether due (1) to decay, (2) faulty design at the outset, (3) environment. It is quite true that the Regulations of the Housing and Town Planning Act of 1909 provided the framework for such a Survey, to be carried out by the Medical Officers. But we know that in the past Authorities have been loath to condemn where they realised that it was impossible adequately to build for those dispossessed; or where special hardship was entailed upon owners who had kept their property in repair, which however was so obsolete in design as to be a menace to health. The Survey required must not be governed by such expedients, but must show, in a scientific and dispassionate way, the extent, location and nature of all slum property in

this Kingdom, just as Booth's Survey of London dealt with the conditions and occupations of the people. This Survey, also, should not be an isolated investigation, but part of an exhaustive study of our national resources and defects, graphically set forth, as a basis for general Reconstruction.

With this survey before the Ministry of Health, the extent of the evil will be manifest and an adequate scheme can be formed by means of which it should be possible within a definite period to sweep away all undesirable houses and substitute others in their stead. Dealt with in this way it will be seen that it is not a question of local responsibility and rates, but of national control. And one of the first things which the nation will have to settle will be the amount which it is prepared to pay for the slums and the land they stand upon. This initial cost has kept back much of the housing activities of local authorities in the past, and it is not difficult to understand their reluctance to deal with the poorest, when one compares the price of £ 350 per acre for which Manchester has obtained land for housing on its outskirts, with the sum of £1,606,688 which London has expended upon the purchase of fifty-one acres of slums; and when one sees that Liverpool has found the cost of a site raised from 40/- a yard to 60/- by the fact that some public houses had to be included in the scheme. A writer on Housing Reform recently said "It is not enough to say that if the community destroys property, the community must be prepared to pay. We destroy bad meat, but instead of paying for it, we punish those who own it," and it is to be seen if the nation agrees with this.

Having made its Survey, obtained possession of the slums, and shouldered the financial responsibility, it remains for the Ministry of Health to decide upon the best method of carrying out the rehousing schemes. However much one would like to see the inhabitants transported en bloc to the fresh

air and gardens of the outskirts, this is too sudden a change to aim at directly, though much can be done by means of improved means of communication, quick and cheap tramways, etc. Indeed, it cannot be too frequently emphasised how closely bound up with general town-planning and city reconstruction is the rehousing of the slum dwellers. Much, of course, depends upon the individual circumstances; in Sheffield, for instance, almost ideal surroundings are found on the tablelands flanking the valley in which the workers are situated; it was only access that was required to this suitable neighbouring land. In smaller towns, also, the difficulties of getting out into new land are not great; and in villages, where it is usually not a case of insanitary areas but of single decayed houses, the new ones can be placed *near* though not actually *on* the sites of the old ones.

But there must always remain a very large population in the big cities that will require rehousing somewhere near their old haunts, and it is here that a new solution may be looked for. Possibly something in the nature of temporary dwellings might be devised, which would last for the period of population flux, succeeding the war. In spite of the playgrounds and amenities of the Liverpool Flats, and their admirable planning one would not like to look upon this as a permanent or universal solution of the problem.

A final word must be said on this suggested National Control. There must be no danger of an excessive centralisation: overcrowding and house provision is an essentially local question and with national aid the local authorities can carry out whatever scheme is devised. But the Ministry of Health must have its local inspectors even as the Board of Education has; and it might be suggested that the country for this, as for other purposes, might be divided up into regions (on a more logical plan than existing counties) each with its Housing Bureau and Resident

Commissioner, who besides being a Government watchdog should be prepared to advise and assist Local Authorities in the preparation of their schemes.* By this means a general national policy could be carried out, with the necessary modifications to suit local requirements, based upon minute knowledge of local conditions.

The question as to why these people are unable to pay an economic rent, is somewhat outside the scope of the Housing of the Poorest, which, as its name implies, presupposes the existence of such disability. The final solution will never be arrived at until every worker receives a wage which will enable him to pay an economic rent. But in the meantime the vicious circle of the bad houses producing the poor physique and low wage earning capacity, and the consequent inability to earn sufficient for an economic rent, must be broken. No Wages Board will be of any service for this class, until the slums are eliminated.

It was quite right to limit the immediate post-war housing, to the provision of entirely new dwellings; but it will be fatal if the housing enthusiasm of the nation, which has never before reached so high a pitch, should cool down after building half a million new houses. When these are completed the local authorities might well turn over the providing of new houses to Private Enterprise (the reduction in building cost and increase in ways having in the interim made this economic proposition) and the next job of work for the local authorities, acting for the Ministry of Health should be the clearance of every slum area and slum cottage in town and country.

* This policy of decentralization of the L. G. B. in order to increase its constructional activities, has been recommended by Committees of the Reconstruction Ministry and the L. G. B.

IRON INDUSTRY IN INDIA.

BY F. B. SHROFF, M.A., M.S.C.I.,

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THE history of iron dates back to very old times. The archæologist and the ethnologist finds it in the old civilisations of Egypt, Rome, Greece and India. But the modern industry which first evolved in England and in which now America reigns supreme is a creature only of the past two centuries. We have been often told that in India once thrived that Iron Industry whose monuments we yet see in the iron girder at Puri or in the gun of Narwar or in the sword of Golconda. But that industry pales before the modern industry in its gigantic scale, in its use of mechanisms and appliances and scientific and economic principles, and in the variety of its products.

The industry ran through vicissitudes and changes in every country. As the needs of iron and steel grew, the processes were improved to cheapen production and to conform to standards of requirements, and these changes in prices and processes reacted on the iron producing centres. Not only the centres passed from provinces to provinces, but the freaks of fortune ebbed and flowed and whirled the status of the different nations.

Charcoal was the only fuel first used in England and America and on the Continent, and the only credit given to those who sold the new discovered fuel, anthracite, was that they were accused of selling stones as fuel. Owing to scarcity of charcoal the iron industry in England in 1740 had dwindled so much that it could not supply the home demand. It was the introduction of anthracite that rekindled the industry, and it is now the use of coke that maintains it. During the charcoal period the trade flourished in the forests which migrated in

the coke period to coal beds and to ports. With introduction of Bessemer process a number of puddling furnaces of South Wales had to be closed and the open hearth process allows the Bessemer centres to eke out their bare existence, on the profits of the phosphatic slag. The ore producing districts of England are almost exhausted and except its cleavland ore, foreign ores are now mainly feeding its furnaces.

And so in America. The introduction of the basic process of steel production opened out a bright future for the phosphatic Lake deposits and the old mines of New York and Pennsylvania thus languished. And the supremacy of England passed out to America, because besides its rich deposits in coal and iron there was a vast market in the developing country and because there was scarcity of labour that drove the manufacturer to superb mechanisms and to wonderful methods of transportation.

And what placed Germany second only to America? The invention of this same basic process was a boon to Germany. In its useless ores of Luxemburg and Lothringen it found enormous wealth. In spite of coal and transportation difficulties, it had been able to establish its position by the levying of heavy import duties, by the formation of syndicates and by the development of its educational and economic policies.

These factors that have been of immense importance in moulding the iron industries of the three biggest iron producing nations of the world must needs engage our attention in shaping a policy for India. They are the nature and extent of raw materials—ore, fuel, flux, furnace materials, etc.—their distances and facilities for working and transportation, the market—both the demand and the distance—together with the facilities of transporting the finished products, location of factories, the adoption of particular processes of manufacture, the use of up-to-date machinery and means of transportation, formation of syndicates and a protected tariff system.

So late as 1897 Mr. Jervoise Baines speaking at the International Congress of Technical Education propounded the theory of want of coal and iron ore in India. It was on the same unfounded notion that a great opportunity of Indian Iron Industry was lost at the time of the first opening of the Railways which created a vast market. The fact is that rich iron ores were long known to exist in many parts of India from Salem and Malabar in the South to Punjab in the North. The rich deposits of Chanda, Jubbulpore and Rewah in Central Provinces are simply awaiting to be worked and so also the deposits of Gwalior in Central India. In the East in Bengal, in Chota Nagapur and in Orissa the ores are now already worked by the Pioneers of the Industry.

The fuel problem is rather not so very encouraging for India. Coal deposits are chiefly located in Bengal and Behar and these are being utilised by the present factories. The Central Provinces show signs of existence of coal beds, a few small mines were actually worked and recently we hear of an important find of a big deposit there, which augurs well for an iron industry in these provinces. In Assam the coal measures unfortunately have no concomitant rich or extensive ore deposits.

Sweden yet supplies charcoal iron of high quality to Sheffield. The charcoal iron of old India was also of very pure quality. But in these days cheaper steel generally replaces that product and it is well nigh impossible for that industry to stand competition.

Electricity is coming into greater prominence in the preparation of high class steel. But whether it will be able to displace the blast furnace it is difficult to say. For that purpose extremely cheap electricity is required, at about one pie a unit. In no place in the world it has been yet possible even to supply at nearly double that rate. India presents very hopeful features for the generation of a cheap hydro-electric power and there is every probability of a big scheme

being undertaken in that direction by the Government of India in near future. But perhaps even that would not satisfy the needs of manufacturing cheap cast iron.

Transportation facilities to carry the ore or coal to the meeting place have been in India, as elsewhere, the important considerations in deciding the location of iron industries. The late Mr. Jamshedji Tata, the Carnegie of India, discerned in the proximity of this fuel to the ores of Chota Nagpur and Orissa a great future for the Indian Industry and launched his adventure. The Bengal Iron and Steel Works are also favourably situated; and the new company which Messrs. Burn and Co., have floated at Calcutta will enjoy the additional advantage of being near the port. These three factories have fortunately not been much confronted with the problems of distances of their two chief raw materials. The embryonic Mysore industry courts not coal and hopes to have a free hand in the South. For the future industries the cases of Central Provinces, Central India and Assam engage special attention on the distances of these raw materials. Pittsburg furnaces are fed from mines one thousand miles apart. But the ore chiefly traverses the Lake and for the small distance for which the ore is carried on rail, the freight is very small. England is supplied by Spanish ore out here again it is carried by ships, besides English factories enjoy the river and sea facilities in export.

Turning to process of manufacture the present process of blast furnace cast iron and the basic open hearth steel will probably have a long stay. These must be also the mainstay or spine of the Indian Industry. But for conserving vigour it must have exercise on the path of progress; it has already the motive factors in the utilisation of the blast furnace slag as cement and in the most recent discovery of the source of potassium salts in the blast furnace gases. But whether any new motive factors will ever develop into wings to fly this industry away from India we cannot say. May God forbid it!

India must make up for any of the difficulties of coal by employment of the most modern mechanisms and of the skilled and expert hands. All these we must import;

but these same will give us home products in the next generation. Will not the Jamshedpur Works be the source of these mechanisms in the near future and will not the contemplated Metallurgical College down there be the source of the expert hands?

Indian manufacturers of iron have not heretofore suffered from internal competition. But do they expect to be immune to that? Will India have the syndicates or corporations of America? Will she have a protected tariff system of Germany? She does not aspire so much for the one, she will not get the other as much as desired. The total world production of pig iron is now nearing a hundred million tons a year of which India is not even producing five lacs. India is consuming about twenty lac tons of iron and steel and their manufactured products of all sorts. The incidence of cost of iron and steel materials to the people of India is about a rupee per head annually. The programmed industrial development and ship-building in India will open a vast market but in order that new iron centres can be created and old may continue to flourish a combination of interests is most desirable. India must export iron and steel. Japan, Australia, Africa, Mesopotamia are yet open markets. Japan has not yet discovered in it rich and extensive ore deposits. But Russia and China are potentialities of first magnitude. Will not Japan have a hand in working these in the future? It looks, once again, the opportune time for developing this industry has come to India. Let not that opportunity slip.

What will be the future of this Indian Industry? Will new centres arise? Will the C. P. find out the coal in near future? Will Gwalior solve its transportation difficulties? Will Assam find out a rich and extensive ore deposit or be otherwise helped? Yes, these may happen. The hydro-electric schemes and the electrification of Railways will cheapen transportation and coal. The growing demand will solve the difficulties of market. Let the present industrialists combine and promote these prospects to realities, let coal be saved and electricity substituted in other industries wherever possible, let markets be allocated so that the present factories supply the home demand. To satisfy the Indian aspirations for industrial development this industrial thermometer must record high.

CHEMICAL METHODS FOR UTILIZING WOOD WASTE.

BY W. B. CAMPBELL, B.Sc.

THE fact that tremendous quantities of wood are wasted in Canada is well-known to everyone. The waste begins in the forest and continues all through the various operations which the wood must undergo before it reaches the consumer in its finished form. Every time the wood is handled a greater or lesser amount of it is lost in some form of waste. Much of this waste is necessary at the present time, but on the other hand a great deal of the waste material can be put to use even now. Moreover, as the timber supply becomes depleted and the incentive to save becomes proportionally greater, a great deal more of this waste will be utilized and will become an economic asset where now it is only a source of loss.

The first form of wood waste to be encountered in studying the question is that of the tops, branches and roots, which are discarded in the bush. As a rule in this country these are left to rot away where they fall, or else they are piled up and burnt to prevent further fire-risk, and to clear the ground for future growth. The logs themselves are usually floated to the mills and there the bark is stripped off and burnt, making another source of waste. These logs are then sawed up and another portion (ten to twenty per cent) goes to waste in sawdust, and still more wood goes into slabs and edgings, which are frequently burnt to dispose of them. Boards are cut to standard lengths and the odd ends are usually wasted. The defective pieces are frequently also burned. The shavings and odd pieces produced in planing mills generally go to waste and those made in actual construction work are practically always wasted. Most of these wastes are small in themselves and

possibly many of them are too small even to be eliminated; but they are wastes nevertheless, and, as such, are responsible for some proportion of the high cost of living. It is only when they are taken in the aggregate that they assume proportions sufficiently great to make an impression on the ordinary layman. When, however, he is told that this waste amounts to \$10.00 or \$15.00 annually for every man, woman and child in the country, it begins to assume proportions such as may seem worthy of his notice.

How much of this waste it is possible to eliminate is, of course, unknown. A great deal of it is inevitable for the reason that the labour-cost of putting many of these products into forms commercially valuable is greater than the value of the products so produced. But some of these can be utilized profitably, and one of the objects of the opening up of the Forest Products Laboratories is to discover and spread the knowledge of methods for such utilization.

Much has been done by the lumbermen themselves through their various associations to make an asset of many forms of waste wood. This work has been mostly along the lines of using up the small pieces produced by the mills which can be used to advantage by other mills, which do not necessarily require that their saw material be in large-sized sticks. Box factories, spool manufacturers, toy makers and factories making such articles as hammer-handles, etc., are frequently able to use the odd pieces produced in the manufacture of larger articles.

But the vast quantities of shavings, sawdust and edgings mostly go to waste yet, and to these is directed the attention of chemists all over the world, since chemical utilization seems to be the most promising field in this connection.

The object of the following brief statements is to present a synopsis of some of the results already obtained, without going

into the details of any of them. While all of these various industries have proved successful—that is, profitable—it should be recognized from the start that in each case much preliminary investigation is absolutely necessary, for what is successful in one locality may prove to be complete failure in another. Most of these industries require a large and constant supply of raw material, expert technical supervision, and frequently a considerable outlay of capital for expensive equipment. The market also has to be considered, particularly in its relation to the particular locality in which the raw material is found. When these conditions are found to be favourable after proper consideration, then it is well worth while going further into the matter.

MANUFACTURE OF PULP AND PAPER.

The manufacture of pulp and paper from wood is an industry which has proved itself stable and of increasing magnitude for a number of years. Almost every kind of wood has been proved suitable for the manufacture of some form of paper, but there are considerations affecting the use of each kind which must always be observed. Most of the pulp is made from the wood cut specially for the purpose, but almost any wood can be used, provided that it is reasonably free from dirt, knots and bark, or that these can be easily removed from it. Sawdust is an exception of this rule on account of the fact that the fibres are cut so short that the pulp produced will not, felt properly and the cooking is made considerably more difficult. There are several mills in the United States at present using mill-slabs, shavings and other forms of waste more or less entirely. The advantages of waste wood are, of course, its cheapness and its quantity. There are several disadvantages. It is usually green and full of water, has a large percentage of bark and comes in irregular shapes. Shavings are rather better for the purpose, and, if in sufficient quantity, make very good raw material.

Another point to be taken care of in using waste material such as this, is to use the raw material of only one species, or, at least, species sufficiently alike that they may respond to the same treatment. For instance, on account of the relatively large content of resin in longleaf pine, it will not do to treat this in the same way as spruce. Neither will it be satisfactory to work hard and soft woods together in any one treatment, though any of these can be worked satisfactorily if kept separate. The process to be used will depend chiefly on the raw material at hand and on the market for any particular variety of pulp.

HARDWOOD DISTILLATION.

The distillation of hardwood, with the resultant production of charcoal, acetate of lime and wood alcohol, is an industry which is well developed and pretty stable. The latter two products are regularly quoted market articles. Charcoal is usually disposed of locally for domestic purposes, unless there is a charcoal-iron furnace within shipping distance.

Besides the wood cut especially for the purpose, hardwood slabs and other odd pieces of hardwood can be used. Where the wood is not cut especially for distillation, the plant is usually run in connection with a saw mill, so that only the part not suitable for lumber is used for the distillation. Almost any hardwood in pieces three or four inches in length and upward is suitable, but sawdust and shavings are not suitable—firstly, on account of the fact that the small size of the material makes it such a poor conductor of heat that it is impossible to char it completely in the ordinary forms of apparatus used, and, secondly, because the charcoal produced is so finely divided as to make it difficult to cool and handle, and because there is no market for it.

The woods most frequently used are beech, birch and maple, with smaller amounts of other woods as they may occur with the first-mentioned.

RESINOUS WOOD DISTILLATION.

The development of the industry of distillation of resinous, or "soft" woods for the production of charcoal, wood creosote and turpentine, is much later than that of distilling the hardwoods, and the practice is not yet standardized to any great extent, though a great deal has been done along this line in the last few years. The value of a resinous wood for distillation is in proportion to the amount of resin, or "pitch," contained in the wood. This resin content is quite variable, even in trees of the same species and in different parts of the same tree, so that some care is necessary in the selection of the wood for distillation to avoid using wood which is too lean to yield a profit.

Pine is the wood most used and is taken mostly in the form of "lightwood." Stumpwood is also used to a considerable extent, but is usually left to the last, since it is much harder to collect and handle. Almost any kind of resinous wood is suitable to some extent, the only question being whether it contains sufficient resin to make the recovery worth while, and so is largely a matter to be considered in connection with the particular location in question. Where sawmill waste is used, the matter of selection is not so important, as the cheapness of this material makes up, to some extent, for the poorer material. This class of material, however, is not rich enough to render the more complex and expensive processes feasible, and the simpler and more rapid steam-distillation processes must be used. This recovers only the volatile oils which were originally present in the wood, and so the process is very wasteful, but is the only one at all successful with this class of material. Destructive distillation plants for resinous wood are the cheapest form to construct. They produce products of rather poor quality, however, and so the market is somewhat restricted. There are also some processes known as "bath processes" in operation. In these the wood is run into a retort and flooded with some

high-boiling solvent of the turpentine and light oils. These are heated and extract the oils from the wood, and are then drained off and the oils recovered from the solvent by distillation with steam. Various solvents are used, but rosin appears to be the best at present.

Processes using a low-boiling solvent, such as naphtha, have found increasing use in the last few years, but the decreasing price of turpentine and the increasing cost of solvent has made the business increasingly difficult.

TANBARK AND TANNING EXTRACT.

Tannin is obtained from the leaves, bark and wood of a great many trees, but only a few of these (practically only hemlock and a couple of species of oak) are used commercially. Usually these are sold in the form of bark and the tanners make the extract themselves. In some cases, however, it may be of advantage to make the extract nearer the bush and save the freight on the bulky bark. The method of extraction is very simple and the extract can easily be concentrated and shipment made easy.

MANUFACTURE OF ETHYL ALCOHOL.

This is a process for the manufacture of ethyl (or "grain") alcohol from wood as distinct from the methyl (or "wood") alcohol produced by the destructive distillation. Ethyl alcohol is not poisonous in the same way as wood alcohol, and a very broad market is open for it, if production is made sufficiently cheap. Since the wood used in this process must necessarily be finely divided, almost any kind of waste wood is suitable as the large-sized pieces can be easily reduced to the proper size.

The process used consists of the conversion of the cellulose of the wood into a sugar; the sugar is then fermented to produce the alcohol and this is distilled off. The process is on a paying basis in Europe, and in at least one plant in America.

CATTLE FOOD.

Cellulose, or wood fibre, may be converted

—at least partially—into a sugar, with comparative ease. There are also several other carbohydrates formed in the process. A considerable proportion of the products so made are digestible by cattle, and, especially when mixed with other products, such as peanut meal, rice meal, alfalfa, it seems to make good cattle food and finds a market.

MANUFACTURE OF OXALIC ACID.

Finely ground wood fused with caustic soda forms sodium oxalate from which oxalic acid may easily be produced. The manufacture of this product may prove profitable, though the restricted market would be against it. A very little wood used in this way would produce all the oxalic acid used in the country. Almost any species of wood is suitable.

WASTE WOOD FOR PRODUCER GAS.

Several forms of apparatus for the production of producer gas from waste wood have been put on the market lately and are finding considerable favour. The production of power from waste wood in this way is much more economical than burning the wood under steam boilers, especially when small-sized stuff, such as sawdust and shavings, are to be disposed of. The commercial success depends on the demand for the power produced. Any kind of wood can be used, though it is an advantage to have it of fairly uniform size and preferably dry. The woods with the higher calorific values are, of course, somewhat more efficient.

Further information regarding any of these methods will be gladly supplied by the Forest Products Laboratories, McGill University, Montreal.

The work of these laboratories is directed entirely along the lines of utilization of wood waste and improved methods in the manufacture of forest products.

All information and results of the laboratories are *free* to the public and will be gladly supplied upon request.

SOME TESTS OF INDUSTRIAL PROGRESS.

BY THE EDITOR.

AMONG the best tests of industrial progress in our State, a ready one is the number of joint-stock companies we are able to put forth from month to month. The joint-stock principle is the index of production on a large scale. It is only production on a large scale that can help towards increased production of wealth. In India generally, and in Mysore in particular, the joint-stock idea has still to take root. Much of our lack of progress is due to the non-recognition of this principle in the domain of production. Capital may be available; machinery may be available; men may be available; and other facilities required may be available. But the organizing ability that can put these different things together and render production on a large and wealth producing scale is one thing wanting. It is *the* thing that matters, however; and it is therefore of the first importance that we should pay increasing, nay, special attention to it. The effects of large scale production are many and various, not the least important are those which have regard to those actively taking part in it. "The stupendous increase of production which is thus rendered possible" says one authority, "reacts upon the labourer both as producer and as consumer. Population increases enormously, and there is continual drift from the country to the city. Industrial society receives its modern shape and the social income is divided into the rent of the land-owner, the wages of the labourer, interest of the capitalist and the profits of the entrepreneur." The joint-stock principle, therefore, requires the utmost extension in this country. It should be our aim to increase the number of joint-stock companies from month to month and

year to year. The need for this extension ought to be obvious to any one who cares to read the signs of the times. In Western countries post-war re-construction is taking shaping in divers ways. In the industrial domain, the growth of combination and organization is a marked feature. The competition that is sure to flow from this will be felt far and wide. The nations that are most progressive will thus get the first chance to succeed in their enterprises. The world conditions are such that only those who possess the best organization will succeed. It is, therefore, necessary that no effort should be spared to spread the joint-stock idea in this State.

The number of joint-stock companies in the State is not great, and the yearly increase is negligible. The returns of the Director of Statistics in India show that Mysore figures the least in them. Take for instance the returns for December, 1918. During that month, 29 companies were registered with an aggregate authorized capital of about Rs. 1,19 lakhs as against 21 Companies with an aggregate authorized capital of Rs. 13,62 lakhs in the corresponding month of the preceding year. Bengal alone accounted for 19 companies (or Rs. 61 lakhs). For the nine months, April to December, 1918, the number of companies registered was 187 with an authorized capital of Rs. 7,93 lakhs, as against 183 companies with Rs. 22,33 lakhs of authorized capital in the corresponding period of the preceding year. The largest flotation in December was that of the Aerial Transportation Company of India, Bombay (Rs. 20 lakhs). Mysore State is conspicuous by its absence in these returns. Speaking generally, in India, over two-fifths of the companies in existence are in Bengal. Bombay comes next, where the cotton mills and presses are all run as joint-stock concerns. Close upon three-eighths of the aggregate paid-up capital thus invested India has been for the working of these mills and presses. In Mysore, the only

important joint-stock concerns are those owned and run by Europeans. Their enterprise, their success and their steady work in their respective spheres ought to be an incentive to us. Just think of the coffee estates, the gold mines, the manganese mines and see how their work has been rendered possible by the joint-stock idea. Their very success ought to make us gird up our loins and see to the spread of this idea among our own people. In the domain of industrial development nothing is likely to give a real impetus as success and success is largely dependent on organized capital, organized skill and organized labour. The man who has brains but has no money has every chance to succeed if the joint-stock principle takes deep root in our soil. The man with little money has a chance to make it more paying to himself and more helpful to those who are more enterprising than himself, this principle obtains a wider application in the State. We do think that the time is ripe for a step forward in this direction. The Government are doing what they could to provide expert help and laws that make for the absolute safety of property invested in joint-stock concerns and it is the bounden duty, we think, of the people to come forward and do their part of the duty. To begin with, we want, so far as we are concerned in this State, joint-stock companies for the following purposes:—Cotton mills to work our own cotton; woollen mills; mills for silk; mining; land and building; *gum* and sugar manufacture; paper; tramways and railways; leather work; saw and timber mills; furniture manufacture; quarrying; and rice and flour mills. In regard to the last two, there has already been some enterprise visible but a wider survey will disclose that there is ample ground still left for energetic hands to work upon.

Another test of progress in the industrial field is the extent of loans obtained by the people of a place for trade and mercantile purposes. In this respect we are, thanks to

the Mysore Bank and those responsible for its working, making some real, though yet slow, advance. During the past five years the total amount advanced exceeded, from the published figures available, 8½ crores, while the bank's turnover ran up to 61 crores. These figures show the increasing volume of business done. There is still ample room for improvement. A great deal still remains to be done to develop the purely industrial side. It is here that the Bank's activities deserve to be developed. It should add to it an industrial side, so that genuine industrial *entrepreneurs* may not be crippled unduly in their enterprises. Much more help ought to be forthcoming to these, if they are to flourish in the land. At present they are badly handicapped in a variety of ways and anything that can be done to improve matters ought to be very welcome to them. The Indian Industries Commission has laid down the main lines on which Government can render help in matters of the kind and it is to be hoped that our own Government will do the needful before very long. The more it is made easy for an *entrepreneur* to obtain the necessary pecuniary aid the better it is for all parties concerned. Loan means industrial activity. The war has demonstrated, despite its dark side, the truth of this common saying. It has enabled our people—as the people of other countries—to realize the possibilities of their own country. Many industries which were taken to be impossible in this country in the pre-war days were proved to be possible in it, if the proper impetus was forthcoming for it. In our own State the blanket industry is a case in point. Efforts should be made to not lose industries of this kind in peace time. In other words, war developed avenues of trade should be kept up and even strengthened. This is what they are doing in the advanced Western Countries and we think we ought to do the same. For instance, in Canada the Imperial Munitions Board spent—so we read in a Canadian manufacturers' journal—

over a billion dollars in building up, equipping and operating seven national manufacturing plants on which \$15,000,000 has been spent. It has built up a great airplane industry and an airplane engine factory, upon which millions are still being spent. The lumbering industry of British Columbia has been developed to an enormous extent, and the Board gave contracts for ninety ships costing \$66,000,000. The Board has also put many of the Canadian exportable food products on such a footing that the benefit will last when the War has been forgotten. There has been, in fact, expansion in Canada in so many lines that the story of its progress during the War, seems incredible. So, it is, in a word, with many an other Western country. Even in India, the War gave an impetus to many industries which were either dormant or entirely dead until they were resuscitated by the necessities created by the War. The recent speech of the Indian Minister for Commerce in the Imperial Legislative Council fully confirms this. Even in Mysore, the same story has unfolded itself. As we have remarked, the blanket industry is a case in point. The duty is thus cast on us to keep such industries active by putting forth further effort. While the Government can be expected to do its part, the people should do theirs; otherwise, progress there will not be for many a decade to come.

Since December 2nd, 1918, says the British Ministry of Reconstruction, seven additional interim Industrial Reconstruction Committees have been formed in the following trades: (1) Artificial stone, (2) brass and copper, (3) women's light clothing, (4) lead-mining, (5) lead, (6) zinc and spelter, and (7) sugar refining. There are now twenty-nine of these committees at work, some of which are reaching the stage when they will be convertible into full Joint Industrial Councils.

MADRAS FISHERIES, 1917-18.

BY "RUSTICUS."

THIS is the first occasion on which the Annual Report of the Madras Fisheries Department has been reviewed in these columns and we are glad to have an opportunity of paying a small tribute to the valuable work which Sir Frederick Nicholson, its Honorary Director, is unostentatiously doing, not only in developing an important industry but also in improving the social and economic welfare of a very backward element in the community. There have been few, if any, members of the Indian Civil Service who have laboured so long and so disinterestedly on behalf of the people of this country after their retirement. It is now some nine years since Sir Frederick Nicholson virtually founded the Department. We trust that, before he finally relinquishes the reins of office, he will give us a connected history of it from the beginning for there is much in the report in regard to which a reader who has not seen previous reports would be glad to have more information. We have, for example, to confess our ignorance of the uses to which *beche-de-mer* is put nor do we know whether chanks can be utilised for any purpose other than the making of bangles.

Though the staff of the Department is small, its activities are numerous and varied. Perhaps the best known of them is the fishcuring and canning work which is carried on at Tanur and Chaliyam on the Malabar coast. The excellent products of the cannery have proved a boon to the district officer on tour especially since the war stopped supplies from Europe. It is not surprising, therefore, to find that the supply greatly exceeds the demand. Sir Frederick Nicholson hopes to be able to supplement it before long by the refrigeration of cheap shoal fish such as sardines and mackerel and freezing

tanks have already been built at Tanur. If the experiment proves successful, fresh fish sharply frozen in ice and salt will be placed on the more distant markets whilst the nearer markets will get fish which has been kept fresh by simple chilling. Sir Frederick does not say whether there are any signs of private enterprise supplementing this branch of the work of his Department. It has already done so to some purpose in the case of oil and guano factories. No less than 253 of these have sprung up on the West Coast since the Department started operations there in 1908-09. Most of them have had a bad time of late owing to the war and the consequent absence of freight for their products but demands from the Munitions Board for oil for military purposes and from the jute mills enabled the oil factories to make a good recovery last year and the outlook for them is now very favourable. By bringing producers and consumers into direct touch and doing away with the almost inevitable but very expensive middleman, the Department was also able to get the price of guano back to its normal level to the great benefit of the guano factories.

Mr. Hornell, the Marine Biologist, gives an account of the work of the pearl and chank fisheries, which are much more concerned with chanks than with pearls. The fisheries had a moderately successful year only except at Ramnad, the strong winds making the sea too muddy for effective operations. Mr. Hornell is also engaged on many interesting lines of research. A study of Indian boat designs and of the physical characteristics of the chief fisher caste of the extreme south has led him to the conclusion that there is a strong infusion of Polynesian blood in the coast population of some of the southern and western districts of India. The Madras aquarium which is one of the most frequented buildings in the city owes much to him and it is to be hoped that, now the war is over, the construction

of the much larger building with a biological station and head-quarters for fisheries, which has been under contemplation for some years, will not be long delayed. One of Mr. Hornell's minor activities is the supply of educational type collections of shell-fish and crustaceans. It is curious that the demand for these comes mainly from the north of India. There seems no special reason why students in the north should show greater aptitude for Zoology than those in the south. Possibly the greater the distance from the sea, the keener the interest taken in its products.

The third main branch of the Department's work is the development of inland fisheries. Had it not been for the serious loss sustained by the death of Mr. H. C. Wilson, the Pisciculturist in April 1917, more rapid progress would have been made in the survey of the inland waters of the Presidency with a view to systematic stocking and culture. Several schemes are in progress for the utilization of the waters of big irrigation reservoirs such as the one at Mopad. An experiment which is worthy of mention is being made in fishing deep water tanks. As a general rule, the method of fishing tanks in Madras is to wait until the water is almost exhausted and then to capture all the fish at once. Obviously, if the tank does not dry up, this method is inapplicable and it remains unfished. The result is that where conditions are most favourable for the growth of fish, the fish are not forthcoming. The Fisheries Department is endeavouring to remedy this. Boats, nets and men have been engaged and the operations are supervised by the staff of the Department. They have, however, met with various and unexpected difficulties, the presence of weeds, the opposition of interested persons and so on.

The work of this branch has very important ramifications. Not only is it valuable in developing a source of food-supply and of revenue but it will, in time, bring about a

marked improvement in health conditions. Some varieties of fish are natural enemies to the mosquito and as all children are now taught in schools, the mosquito is the natural enemy of man, as it is entirely responsible for the ravages of malaria. The realization of this fact has caused many local bodies to turn their attention to the stocking of tanks and wells with fish that prey on the larvæ of the mosquito and the Ippur fish farm is almost entirely engaged in supplying the demand for these. The Department itself has taken in hand the cultural and sanitary development of the Fort moats at Vellore and Chingleput.

We spoke at the outset of the social and economic work which is being done by the Department among the fisher community. Sir Frederick Nicholson was one of the pioneers of the co-operative movement in India and it was to be expected, therefore, that he would turn his attention to the possibility of co-operation. Apart from societies amongst fishermen organized by the Co-operative Department, the Fisheries Department has already established ten credit and one productive society whilst several others are awaiting registration. The productive society has been formed by oil and guano producers in the Mangalore Taluk and it is hoped that its formation will mean not only increased production and better sales, but also better classes of goods as the society will refuse products not up to standard. Two Temperance Societies are doing good work and at Tuticorin and Rameswaram counter attractions to the toddy shop have been provided in the shape of coffee stalls at which coffee, tea, and country cakes are supplied at cost price. Educational work is also in progress but we are told nothing more than that general proposals have been made and concurred in by the Director of Public Instruction.

It remains to add that the Department more than paid its own way during the year, the receipts which amounted to just over Rs. 2½ lakhs exceeding the expenditure by Rs. 6,180. Considering how large a portion of the expenditure is devoted to research, experiment and supervision, this is a very satisfactory result. There can be no doubt that the fisheries of India are an important asset to the State and that money spent on their improvement and development is money well laid out.

AGRICULTURAL RECONSTRUCTION IN GREAT BRITAIN AND IRELAND.*

THE Agricultural Policy Sub-Committee of the Reconstruction Committee, appointed in August 1916, to consider and report upon methods of effecting an increase in the home-grown food supplies, having regard to the need of such increase in the interests of national security, has just issued its report which is a full exposition of the position of agriculture in this country. It opens with an historical preface which is a brief survey of agricultural conditions during the last hundred years and the political and social factors exercising and influence on them; and it proceeds to deal in detail with the various problems connected with British agriculture. A number of more or less drastic recommendations are made by the committee with the object of ensuring agricultural reconstruction.

The subject dealt with include:

- (1) Effects of the agricultural depression;
- (2) Need for a new agricultural policy;
- (3) Agricultural wages;
- (4) Price of wheat and oats;
- (5) Effect of guaranteed prices on rents;
- (6) Method of securing increased production;
- (7) Sugar beetroot;
- (8) Scope and limitation of the inquiry;
- (9) The departments of agriculture;
- (10) Organization and co-operation;
- (11) Agricultural credit;
- (12) Small holdings, ownership, and tenancy;
- (13) Village reconstruction, village industries, and rural life;
- (14) Tithe redemption;
- (15) Local taxation;
- (16) The Agricultural Holdings Act;
- (17) Reclamation and drainage;
- (18) Deer forests;
- (19) The elimination of pests and weeds;
- (20) The supply of artificial manures;
- (21) Weights and measures; and
- (22) Transport.

It is not proposed to give here a summary of the whole report. The following verbatim abstracts of some of its principal parts will afford an idea of the committee's views and recommendations.

INTRODUCTION.

"We desire at the outset to explain that we were informed that the question asked us did not refer to war but post-war conditions, and our report is drawn up from that point of view only. Nevertheless, it is evident that for some time after the war agriculture must be seriously affected by the conditions which have prevailed during the war. Any inducements and assistance, which the farmers receive now to keep their fields cultivated or to cultivate additional land, will bear fruit in the post-war period, and may even be considered as direct steps towards the object we have in view. We trust, therefore, that we shall not be considered to have passed beyond our legitimate subject when we express our conviction that farmers need and deserve all the help and encouragement which His Majesty's Government can possibly give them at the present time.

"The experience of the war has shown that the dependence of the United Kingdom on imported food has already involved the country in special difficulties, and in the future may become a source of real danger. We have found that it has increased the cost of the war; aggravated the difficult problem of regulating foreign exchange; and absorbed an undue proportion of the tonnage of the mercantile marine at a time when its services have been so sorely needed for other purposes. We are conscious also of the possibility of a development in the construction of submarines which in a future war might make impossible a continuous supply of food to the people of the United Kingdom from overseas. We hope and pray that the greater sanity of nations and their increased obedience to the Divine law may

*With acknowledgments to the *International Review of Agricultural Economics* of Rome.

save our country from any repetition of the hideous catastrophe which has to-day overwhelmed Europe, but we can feel no positive assurance that this will be the case, and we do not think that we should be faithful to our trust for our descendants if we omitted to take any practicable measures to increase the national safety in a future time of need. We can well imagine that in some future struggle the comparative independence of the United Kingdom of a supply of food from overseas might be a determining factor of victory. Apart from these grave considerations, it is evident that, after the war, the financial and physical welfare of the country will demand that the productive capacity of the soil should be developed to the fullest extent. Burdened with a huge debt, the nation will be strongly interested in producing as much as possible of its food at home, in order that it may buy as little as possible abroad. Exhausted in man power, it will find in the expansion of the rural population of these islands the best restorative of its vitality and creative energy.

"We have approached the problem entrusted to us exclusively from the point of view of national security and welfare, and we have endeavoured to formulate a scheme of agricultural policy which may be generally accepted by the nation and adhered to through a long course of years".

NEED FOR A NEW AGRICULTURAL POLICY.

"We are confident that, as the years pass by and agriculture becomes more intensive in the United Kingdom, an increase of production will be reached which would now appear impossible to many farmers, and that, if the agricultural policy which we recommend is carried out steadily and continuously, a great change will be effected within a generation.

"Nothing in agriculture can be done by the wave of a magician's wand. Results can only be produced in the United Kingdom

as in Germany by a constant and consistent policy. The State must adopt such a policy and formulate it publicly as the future basis of British agriculture, and explain to the nation that it is founded on the highest consideration of the common weal. It must be explained to landowners, farmers, and agricultural labourers alike that the experience of this war has shown that the methods and results of land management and of farming are matters involving the safety of the State, and are not of concern only to the interests of individuals. They must be plainly told that the security and welfare of the State demand that the agricultural land of the country must gradually be made to yield its maximum production both in food-stuffs and in timber. The history of our country shows that, when once the path of duty is pointed out to them and they understand how grave is the responsibility put upon them, neither landowners nor farmers nor agricultural labourers will fail to rise to the emergency.

"There is much excellent estate management and much high farming in the United Kingdom to-day, but there is also much slack estate management and bad farming, or management and farming which, while profitable to the persons interested, do not take national requirements as to food production into account. That this is so is known to all who have studied the present conditions of British agriculture. The causes of bad estate management and farming are lack of suitable education or of capital (often found in combination) on the part of landowners and farmers, the personal equation of character, the excessive encouragement of game, the acquisition of land for the sake only of its amenities, and the conviction that the State has no interest in the treatment of agricultural land and that it is the concern only of the individuals dependent upon it.

"The general average of farming must be steadily and continuously raised throughout

the United Kingdom; the grass land and the arable land alike must be more intensively cultivated; the improvement of live-stock, for which landowners and farmers have done so much even through the years of acute depression, must be progressive; much grass land must be reconverted into arable; the sugar beet industry and the manufacture of potato products can be introduced into British agriculture to its great advantage; estates must be managed with a single eye to maximum production; capital must be attracted to the industrial equipment and improvement of the land and to the operations of intensive farming; agricultural labourers must be provided with an adequate supply of good cottages; small holdings both of owners and of occupiers must be fostered to provide a "ladder" for the agricultural labourer and for the demobilized sailors and soldiers; the organization of agriculture must be developed; the country must be permeated with a complete system of agricultural education; the status of the department of agriculture must be improved and their powers enlarged and reinforced by association with existing agricultural and administrative bodies, both national and local. All these questions and others of much importance, such as reclamation, the incidence of local taxation, credit, the working of the Agricultural Holdings Act, etc., etc., will be dealt with in our report, which will present a scheme of agricultural policy as one whole; but we think it our duty to put in the forefront our conviction that a basis of security and stability of the conditions under which agriculture is to be carried on in the future must be the foundation of the whole structure, and that without it the increase of production, which we predict, cannot be realized.

"We are of opinion that the conditions of agriculture must be made so stable that out of its profits the agricultural labourer can be assured a fair wage, the cultivator of the soil a fair return for his capital, energy,

and brains and the landowner a fair return for the capital invested in the land, and we believe that this stability can never exist so long as there is a possibility of a recurrence of the prices of the late period of depression.

"We recommend that the State should fix a minimum wage for the ordinary agricultural labourer in each country, guarantee to the farmer a minimum price for wheat and oats, and take steps, as set forth in later paragraphs, to secure the increase of production which is the object of the guarantee. The cereal crops are the pivot of agriculture, and we do not consider that dairy and stock farming will in any way be prejudiced by our proposals. Moreover, as we have already stated, these very important branches of the agricultural industry can be more, not less, advantageously conducted on arable land than on grass land. In the United Kingdom there is land so adapted to pasture that its retention in grass can be defended on economic grounds. There is also grass land the soil of which is a clay so sticky that in the climate of these islands under the plough "season can only be got upon it" once in three or four years; and there is other land where the climatic conditions render the harvest precarious. It would be useless to plough such land. Of the remaining grass land a large proportion could be ploughed up with advantage to the farmer, the landowners, and the State. The interests of the State demand that more land should be put under the plough, and any landowner and dairy or stock farmer, who chooses to convert part of his grass land into arable, could at once obtain the benefit of the guarantee and at the same time increase the output of his particular products.

"We have no authority to consider the fiscal policy of the country as a whole; our reference, though a very important one, is strictly limited, and we shall confine our report to an answer to it. At the same time

we think it right to put on record our opinion that if the State, for reasons of general policy, were to adopt a tariff on manufactured goods, then a tariff corresponding in degree (with the necessary differentiations between the products of the empire, of allied, and of other countries) should be imposed on imported foodstuffs such as dairy produce, meat and corn, and that special consideration should be shown to the produce of the more intensive forms of agriculture (of which fruit and hops and flax may be cited as examples), where the capital invested and the annual expenditure in cultivation and the proportion of that expenditure on labour, are particularly large."

METHOD OF SECURING INCREASED PRODUCTION.

"The government has no fairy touch which will enable it to produce instantaneous results. It must work through, and by means of, the men who are now holding and cultivating the land. If it was so foolish as to try and do their work as well as its own, the only result would be to bring agricultural production to a standstill. There is no body of men in existence except the farmers of the United Kingdom and those who have qualified, or who are qualifying, to become farmers, who are capable of farming the land. Technical knowledge based on experience is just as essential for successful farming as education and brains and capital. It is when all these qualifications exist in combination that the best farming is found. Therefore the State must give time to all concerned to adjust themselves to the new conditions dictated by considerations of national safety. It should formulate its policy and explain the reasons for it in simple definite terms; it should make clear the part it proposes to play itself, that the policy explained will be steadily and consistently followed, and that, while the policy is being worked out the agricultural industry will not be subjected to any harrassing legislation. The State must, in short,

take every means in its power to give confidence and a sense of stability to landowners, farmers and agricultural labourers. It must then tell those classes exactly what is expected of them, and appeal to their highest instincts of patriotism to put personal predilections aside, and to unite to carry out a policy on the success of which the safety of their country may some day depend. The standard set before their eyes should be the highest—not to be content till the whole soil of the United Kingdom is producing the greatest possible return of foodstuffs or of timber. It must be clearly understood that henceforth bad farming is a danger to the State, and that the waste of good land on game or games is inconsistent with patriotism. There will be plenty of room for game or golf in moderation, but too much game, or golf links carved out of fat land, make an inroad on the production of foodstuffs which can no longer be defended. Rabbits must be recognized to be what they are, a curse to both agriculture and forestry. There are localities where the rabbit defies extermination, but the effort to deal with the pest should never be intermitted. The theory in fact should be that rabbits are only to be tolerated in completely enclosed spaces, where the ground is of such a nature that it can more advantageously be devoted to the production of rabbits than of any other foodstuffs.

"When all this has been explained to them, landowners and farmers should be informed that they will be given reasonable opportunity to adjust themselves to the new conditions. The agricultural labourers being secured their share of profits by the institution of a minimum wage, the landowners and the farmers may be left to adjust their shares between them and also to come to an agreement (which is essential) about the relaxation of covenants against the ploughing of grass land or of any others which tend to discourage good farming. We are satisfied that they will have no difficulty in doing

so much more satisfactorily than the State could for them.

"We entertain no doubt that landowners, farmers and agricultural labourers alike will realize the greatness of the trust reposed in them, that they will rejoice at the recognition of the fundamental importance of agriculture to the national life, and that they will do all, and more than all, that their country demands of them. But we recognize that, when once the State has embarked on such a policy as we recommend, for the sake of the nation's safety, it can run no avoidable risk of its failure. Neither the idiosyncrasies nor the incapacity nor the lack of patriotism of individuals can be allowed to interpose even a partial barrier to the success of a national policy....."

NEW POWERS FOR THE BOARD OF AGRICULTURE.

"We recommended that the Board of Agriculture should be empowered temporarily to supersede the landowner in the management of the estate for all purposes essential to agriculture. It should put the estate, or such portion of the estate as it might deem necessary (except the mansion and the garden and park, if any, attached to the mansion), into the hands of a manager whose salary should be fixed by the Board of Agriculture and made a charge upon the estate. He should have the same powers in respect of the management of the agricultural land included in the estate as the owner had, and he should manage the estate as trustee for the owner. He should be a man of proved experience and capacity in the management of an agricultural estate, and he should render a yearly report and statement of accounts to the owner and to the Board of Agriculture. The balance of income, if any, derived from the estate after the payment of the necessary outgoings should be remitted half-yearly to the owner by the Board of Agriculture. When once the management of an estate had been so taken over by the Board of Agriculture, it

should retain that management for five years, unless within that period there had been a successor in title to the original owner, in which case the estate should be handed back to his management at the end of the current farming year, if he so desires it and is prepared to accept such liabilities as may have been incurred in connection with it. If there had been no change of ownership within that period, the Board of Agriculture should be empowered to hand back the estate to the original owner at its termination if it was satisfied that the future management of the estate would be satisfactory. If it was not so satisfied, then it would continue to manage the estate for another quinquennial period, and so on from five years to five years, until there had been a change of ownership. The owner should throughout be undisturbed in the exercise of sporting rights over the estate, subject to the power of the manager of the estate to prevent those sporting rights being exercised in a manner detrimental to agriculture or forestry. If the owner of such an estate is unable or unwilling to develop it for the purpose of agricultural production, the Board of Agriculture should have the power to borrow from the Land Commissioners and to develop it for that purpose by the expenditure of capital, the charges for which (interest and sinking fund) should have priority over all existing charges on the land charged according to the principle embodied in the Improvement of Land Act, 1864. During the period of supersession the power of the owner to make any fresh charges on the estate, or part of the estate, should be suspended, and the existing charges on it, whether by way of mortgage or of settlement, should be paid out of the proceeds of the land by the Board of Agriculture.

"For the guidance of all concerned it should be laid down that it shall be the duty of every landowner so to manage his estate, and that it shall be an implied condition in every lease or tenancy agreement, that the

tenant of agricultural land shall cultivate the same according to the approved practice of the best agriculture, with a view to the economic production in the interests of the community of the greatest amount of foodstuffs (for man or beast) of which the land, having regard to its quality and position, is reasonably capable.

"Where land is being badly farmed by a tenant who holds a lease, and who persists in farming badly after being duly warned of the ultimate consequences, the land-owner may bring the case before the Board of Agriculture, at the same time giving formal notice of the action to the tenant. The Board should thereupon ask the local panel to appoint assessors resident in another county than that in which the farm is situated to report upon the farm, and in due course should refer their report to the Review Committee. If, as the result of the unfavourable nature of the report in respect of the farming of the land, the Review Committee so recommended, then the Board of Agriculture should be empowered to call upon the landowner to give twelve months' notice to the tenant to quit, and that notice should have effect as if the tenant had held no lease, but was a tenant holding on a yearly agreement.

"In the later part of our report we shall deal with agricultural organization in all its aspects, but it is advisable to state here that in our opinion the Agricultural Department in each county should, in carrying out the duties described in this part, act in constant consultation with a National Agricultural Council or Board, which we hope may be formed so as to represent the progressive agricultural thought of the country and fulfilling analogous functions to those exercised by the German Agricultural Council" *

RURAL COTTAGES.

"The provision of good cottages for agricultural labourers with ample gardens

* See MIDDLETON: The Recent Development of German Agriculture.

attached to them was an urgent question before the war. We desire to impress upon His Majesty's Government with the greatest emphasis at our command that there can be no hope of a satisfactory development of agriculture as long as the demand for cottages remains unsatisfied. The provision of these cottages should be taken in hand without a moment's avoidable delay after the war. In another part of our report we shall deal with the improvement of the amenities of rural life, the reconstruction of stagnant villages, and the provision of an agricultural "ladder" for the labourers by means of small holdings. We mention these subjects now lest it should be supposed that we consider that the interest of the labourer in a national agricultural policy is limited to the questions of wages and housing.

"Our attention has been directed to the point that some amendment in the Settled Land Acts may be desirable to allow a share of the proceeds of the sale of a portion of a settled estate, to be expended on improvements other than those specified in the existing Acts....."

NEED FOR TECHNICAL ADVICE.

"To bring about the changes in farming which we contemplate it will be necessary for the State, in addition to providing farmers with security against loss, to place at their disposal the best available scientific and practical advice. Indeed, it will be impossible to carry out the scheme (except with serious loss and wastage) unless it is accompanied by an important development of the facilities at present available in the United Kingdom for agricultural education, technical advice, and research. It will be necessary to insist on the importance of drainage, and to demonstrate throughout the country the best means of converting grass land to arable, the best methods of manuring, and the best varieties of seed; and to carry out on a much more complete system than has hitherto been attempted demonstrations devised to show that increased

production can be secured without loss of profit. These subjects are, however, of such importance that we are deferring their consideration until the later part of our report."

ORGANIZATION AND ADMINISTRATION OF THE DEPARTMENTS OF AGRICULTURE.

"The first thing necessary after the war will be to unite the whole department of agriculture under one roof. Proper administration is quite impossible when a department is scattered into a dozen separate houses in half a dozen different streets. The minister in charge of the department should be styled, as now, President of the Board of Agriculture, but his salary and status should be raised to an equality with that of the President of the Board of Trade and the President of the Local Government Board. The staff must be increased and strengthened; especially it needs the infusion of a proper proportion of Class I of the Civil Service; those members of the staff from whom expert, or at any rate practical, knowledge is required should be selected by a combination of the systems of nomination and examination; the First Division men, who enter through the Civil Service examination, should spend at least two out of the first five years of their service out of London; it is in our opinion important that they should get an early insight into the working of agricultural administration, either on the provincial staff of the department or attached to the staff of local authorities. The provincial staff of the department requires re-organizing. Before the war the work of most of the provincial officers covered an impossibly large area, but many fresh appointments have since been made in connection with the campaign for food production; in some cases officers may be made responsible for all the work of the Board in a given geographical area; in other cases the work of officers must be specialized. In this paragraph of our report we merely indicate the

fact that the staff of the department must be permanently expanded above its pre-war strength. In subsequent paragraphs we shall explain what the work is which in our opinion it should do. It may, however, be convenient in this place to draw attention to the fact that the work of other departments of the State must affect the welfare of the rural population and the state of agriculture. This is particularly true of the Board of Education, and of the Local Government Board in respect of the housing problem. It seems to us necessary that in dealing with rural housing the Local Government Board and dealing with elementary and secondary education in agricultural districts the Board of Education, should work in close touch with the Board of Agriculture. The organization of the department in London must be remodelled in the light of experience and in consequence of its increased responsibilities. There is, however, one aspect of this re-organization to which we wish to draw special attention. It will certainly be necessary to create a division charged with the management of all agricultural properties permanently or temporarily placed under the control of the Board of Agriculture. But the President of the Board, in his capacity of a Commissioner of Woods and Forests, is already responsible for the management of the agricultural properties of the Crown. We think that it would be a good plan to amalgamate the agricultural side of the Office of Woods and Forests with the Management Division of the Board of Agriculture, and to put both sets of agricultural properties under the same control.

"As in Scotland, so in England and Wales, the War Agricultural Committees of the Country Councils* should be replaced by

* Since this paragraph was drafted the Board of Agriculture has been empowered under the Corn Production Act to authorize approved bodies to exercise any of the powers of the Board under Part IV. of that Act, with a proviso that the bodies so authorized shall, in the first instance, consist of persons who are acting as members of the County War Agricultural Executive Committees. This enactment, therefore, provides a natural link between the Statutory Committees here recommended and those already in existence.

statutory committees, which, when constituted, should have powers of action independently of the County Councils, as in the case of the corresponding committees in Ireland and of the Education Committees in England. They should be composed of men and women who are not members of the County Councils, as well as of members of the County Councils, but in both cases alike it is essential to secure the services of persons with practical knowledge of agriculture or some other branch of rural economy, or representative of some special rural interest rather than of the different districts of the country. These Agricultural Committees should absorb the work of the existing Small Holdings and Allotments, Contagious Diseases of Animals, and Agricultural Education Committees (or Sub-Committees) of the County Council, and of the Live Stock Committees established by the Board of Agriculture in various counties within the last few years (all of which committees should be abolished), and they should undertake any other duties entrusted to them by parliament or delegated to them by the Board. A County Council should have the power to set up more than one Agricultural Committee within its area, and the Agricultural Committee should have power to form District Sub-Committees.

"The Agricultural Committees of England should elect two representatives from each County Council area to serve on the English National Agricultural Council, already suggested in this report. The President of the Board of Agriculture should nominate to it persons representative of all agricultural interests, so that, however, the total number of nominated members shall not exceed one-third of the council. The President and the Parliamentary Secretary of the Board of Agriculture should be *ex-officio* members. The council so composed should meet at least twice a year to discuss questions of agricultural policy brought before it by the president, or by any of its members on due notice given, and the president or, in

his absence, the parliamentary secretary should preside over its meetings.

There is already in existence a Welsh Agricultural Council which is not statutory but does useful work. We recommend that this council should continue to perform the functions of a national agricultural council for Wales, and that it should be made a statutory body for the purpose of advising the Board of Agriculture in regard to agricultural matters in Wales, to which the Board may delegate certain powers and functions relating to local administration. The council should consist as at present of two members elected by each Agricultural Committee in Wales and Monmouth and the agricultural departments of the two colleges, with not more than twelve members nominated by the President of the Board of Agriculture. The President and the Parliamentary Secretary of the Board of Agriculture should be *ex-officio* members, and the President or, in his absence, the Parliamentary Secretary should preside over its meetings. All the local work of the Board of Agriculture in Wales should be under the charge of a Principal Officer of the Board, who should be assisted by an adequate staff and have his head-quarters and office at a centre in Wales convenient for North and South.

"We recommend also that there should be established an Agricultural Committee for England and Wales, composed of the President and Parliamentary Secretary of the Board of Agriculture, eight members elected by the English Agricultural Council, two members elected by the Welsh Agricultural Council, and three members appointed by the President of the Board of Agriculture. The committee should meet regularly every quarter, and on special occasions when summoned. The president or, in his absence, the parliamentary secretary, should preside. It should deal with any business brought before it by the president, but its members should be free to raise and discuss and pass resolutions on any subject of

interest to agriculture or rural life in England or Wales. The proposed annual estimates should be laid before the committee and discussed by it before being laid on the table of the House of Commons, and when so laid they should be accompanied by a memorandum expressing the opinion of the committee upon them. All resolutions of the committee should be laid upon the table of both Houses of Parliament if so directed by them.

"The National Agricultural Councils for Scotland, England, and Wales, and the Agricultural Committees for Scotland and for England and Wales, should be appointed afresh after every general election of the county councils; and the members selected, whether by the county councils, or by the Presidents of the Boards of Agriculture, or by the National Councils, should hold office untill the next general election of the county councils.

"If our recommendations are adopted there will be in existence in the United Kingdom four National Agricultural Councils, representing agriculture in Ireland, Scotland, England, and Wales. We suggest that it would be of great advantage to agriculture if delegates from these councils, say, thirty for England and five for Wales, and ten each for Scotland and for Ireland, were to meet in conference once a year. The conference should never be held two years running in the same country, but in each country in turn, and the minister responsible to parliament for the agriculture of the country in which the conference is held should act as its president for the occasion. An officer of one of the departments of agriculture should be permanent secretary of the conference, and responsible for the custody of its records. We believe that the result of such conferences would be to diminish the chances of friction between the three departments, to encourage the pursuit of a common policy, and to inform public opinion of the special difficulties and needs

of agriculture and of its magnitude and importance as an industry. It would be a great encouragement to agriculture if His Majesty the King would graciously consent to become permanent patron of the conference of the combined councils."

EDUCATION OF WOMEN.

"Before quitting the subject we have something special to say about the education of women who can play a great part in the reconstruction of agriculture after the war and whose intellectual interest in country life must be surely aroused if we wish to secure an increased rural population. We hope that numbers of the women who have been working on the land during the war will wish to remain in agricultural occupations and to avail themselves of the openings which will be presented to them in many branches of farming, such as dairying in its various forms, pig-breeding, and poultry keeping. We hope that every possible encouragement will be given to women so disposed and that the agricultural colleges will see to it that their courses are made suitable to them, and that the posts of lecturers are as open to fully qualified women as to men.

"The subject has already been fully dealt with in the report (1915) to the Board of Agriculture and Fisheries of the Agricultural Education Conference (Agricultural Education for Women), which did such a great service in stimulating an interest in agricultural education. We desire to express our complete concurrence with the following reflection extracted from paragraph 2 of the report: 'It is between 14 and 16 years of age that so many of the girls brought up in rural districts at present lose touch of country life. No matter what facilities for agricultural education may be offered to them later, these girls will have neither the taste nor the aptitude for it. This is a matter for serious consideration in view of the fact that it is women no less than men who are responsible for rural depopulation, and

that there is no inducement in the form of higher wages which will tempt them to return.' The fact is that the local conditions which have brought about rural depopulation, bad housing, low wages, lack of prospects, affect women even more than men, and that the influence of women might be exerted in the opposite direction if they had been taught to make more comfortable homes with less drudgery, and if they had the necessary knowledge to enable them to build up a social order in which the natural advantages of country life could be made to counterbalance the artificial attractions of the town."

PURCHASE OF LAND BILL.

"We recommend that the principles of the Purchase of Land Bill should be adopted and an Act passed to give effect to it. We attach special importance to clause II of the Bill, which prohibits sub-division and sub-letting and we strongly advise that the principle of this clause should form an integral part of any purchase scheme."

VILLAGE RECONSTRUCTION, INDUSTRIES, AND SOCIAL LIFE.

"The intimate connection between a plentiful supply of agricultural labour and an increase in the output of home-grown food—the primary object of our reference—was recognized in the early stages of our enquiry, and the recommendation with regard to farm wages contained in Part I. of our report was framed to meet the competition of other and better paid industries. But, in our opinion, the question is not merely one of wages; the conveniences and interests of town life exercise an attraction upon the young rural labourer which can only be met by offering counter attractions in the country districts; and no agricultural policy will be worth having which does not aim at a better developed social life in our villages, at the introduction of fresh industries into the country districts, and at a large increase in the rural population. To this end an effort must be made to break through the

stagnation in the life of too many villages by offering better opportunities for social intercourse and amusement, by arousing a stronger feeling of corporate existence and responsibility, and by opening out improved prospects of advancement to the energetic and hard working. With the advance of education a desire for greater opportunities has arisen among the more active and ambitious of the younger generation, causing them to covet the greater scope for their energies offered in urban districts. The proposals made under this head of our report are designed to lessen the despondency of outlook sometimes associated with existing conditions and to provide a machinery, which does not at present exist, for the improvement of village life.

"The difference between villages, even in the same neighbourhood, is often marked. Some seem to carry outward evidence of the prosperity and happiness of their inhabitants, while the aspect of others, less fortunate, seems to indicate with equal plainness a dull and colourless outlook. In the former are seen smiling gardens, well cultivated and conveniently situated allotments, cottages in good repair, village playgrounds, and social clubs and reading rooms; in the latter, with land in abundance around, we find cottages possessing no gardens or insufficient gardens, huddled together so as to reproduce some of the evils of town slums, and absence of all the amenities of life, and allotments so distant from the centre of the village as to be difficult of access and inconvenient for cultivation, the whole presenting an appearance indicative of the conditions prevailing therein. Enquiry will usually show that the difference is due to the fact that in one village a guiding spirit has exercised a sustained policy of development, based upon a clear perception of the requirements of the inhabitants and a study of the best means of providing for them, while the other has been without these advantages. In this connection it has been pointed out that an examination of the maps

of the Ordnance Survey reveals how lacking in system has been the development of the ordinary village. In its midst, even adjoining the village street, may be often found land let with large farms, which might better be used for housing or other public purposes, for providing gardens, cow pastures or allotments, or for occupation with adjacent cottages. But it is no one's business to take the lead in demanding a better scheme of use for the land, nor does any machinery exist by which a rearrangement could be carried out. An atmosphere of stagnation prevails, and it is not surprising that the best men in such districts prefer to try their fortune in places offering greater scope for their ambition. The less efficient remain, and the deterioration in the rural working population, of which complaint is often made, becomes an accomplished fact.

"We are of opinion that the machinery of the Parish Council, the Agricultural Committees of the Country, and the Board of Agriculture should be utilized for the purposes of village reconstruction, and that under proper conditions the necessary land should be acquired by compulsory powers if it cannot be acquired by voluntary agreement. If cottages are built or small holdings are created, we think that the inhabitants of the village should be given the option of tenancy or ownership, but that ownership should not carry with it the power of subdivision or of utilization for a different purpose than that for which the house was built or the holding created. The money required for a scheme should be advanced out of public funds, and repaid by the parish council and the parties benefited, following the exact analogy of a scheme under the Small Holdings and Allotment Act, 1908.

"We have been much impressed with the value of the work done by the Rural League in establishing villages industries and of the Agricultural Organization Society in establishing women's institutes and we recommend that either the Agricultural Organization Societies in the three countries or some analogous body should receive distinct grants for these specific purpose, and that the task of fostering village industries and of forming women's institutes should be entrusted to them under the supervision and control of the respective departments of agriculture."

ECONOMICS IN THE WEST.

A New Era.

London, 21st Nov. 1918.—After the long night the dawn: after the greatest war in history reconstruction on a colossal scale. We are witnessing the opening a new era and of one which must profoundly affect the bases of our economic life. It is not merely that the unexampled ravages of war have to be repaired, the finances of a period of unparalleled expenditure restored to equilibrium, but that new hopes and new forces have been called into play which must change much, and perhaps nearly everything, in the old World rapidly disappearing below the horizon. I do not refer here so much to political as to economic influences. The war with all its bloodshed and horror has not been without its compensations, and amongst these is the spirit of invention it has called into play. Evoked primarily by the military exigencies of the time this has brought into existence many new appliances and processes which will be of incalculable service in the promotion of the arts of peace. And it has also permitted the intensive development of not a few activities which in ordinary peaceful times would have had to undergo a necessarily slow and expensive stage of experimental service. Sanitation, surgery, agriculture, locomotion, engineering, applied science—all have benefited. But the greatest factor of all which emerges from the welter of war is the conquest of the air. The aeroplane, a few years ago little more than a mechanical toy is to-day one of the great features of our practical civilisation. Distance has been annihilated in the war by aerial flight in a way which makes not only possible but probable that the ends of the earth will be reached in a period of days not greater than the weeks which are now required for communication. I anticipate that before many months are

out we shall have a regular air service to India—aeroplanes carrying mails and even passengers from London to India in two or three days. Think what this means for the future relations of the East and the West! Every department of life will be invigorated by this new and inspiring influence. We shall enter upon the new World which Peace has opened up with the old barriers imposed by distance broken down and that close inter union made possible which is the best antidote to distrust and enmity.

MESSAGE OF HOPE.

Probably to no part of the world does the new order carry a greater message of hope than to India. The lessons of the war plainly revealed in our industrial and commercial life here at home are even more conspicuous in your country. You cannot if you would sink back into the old apathetic attitude which was shown by rulers and ruled to the needs of Indian industry. The splendid services which India has rendered in the provision of the equipment of war shows that she has the power as well as the means to take a great and even leading place in a reconstructed world in which the arts of peace will be predominant. Her inexhaustible mineral resources, her wealth of the essential raw materials of modern industry, her docile and teachable population, and her means of developing power on a gigantic scale and in an economical way all give her advantages which if rightly used must win her success in the future as an industrial country. By what means she shall attain this position it is for the experts to determine. The Industrial Commissions' report makes many helpful proposals and if the lines it suggests are followed a great deal will have been accomplished. But after all it is the action of Indians themselves which will be the decisive factor. If they are prepared to equip themselves by education and training, as they must be equipped if they are successfully to compete with other nations, they will win through; but if on the other hand,

they drop back into the old rut in which they made their way through life in the old easy going times when a Government appointment or a pleadership was the goal of the ambition of the intellectual youth of India, they will not secure for their country the position to which it is entitled amongst the commercial nations of the world.

DISPOSAL OF WAR STORES.

Not the least of the problems with which the Government is faced in the time that lies before it is how to dispose to the best advantage of the immense war stores which have been accumulated. In the House of Commons the other day an official speaker gave the value of these stores at £500,000,000. Imagination fails to grasp what this figure means when reduced to terms of stock—to the innumerable appliances machinery and goods which are in custody of the war departments. Much of the sum no doubt covers the splendid equipment of the munition factories which are to be found in every part of the kingdom. A considerable amount represents raw material and transport vehicles and appliances. For a very large proportion of the whole there will no doubt be an excellent use found in the reconstructed commercial system, but there will still remain a surplus for which a market will have to be found abroad. Motor vehicles particularly will be found at the close of the military operations in such numbers as to require for the exhaustion of the supply a very heavy demand from abroad. Here seems to be the opportunity for British territory outside the United Kingdom which is in need of road transport. There is nothing finer of the kind than the British motor lorries and there should be ample room for them in a country like India whose magnificent distances call for the employment of transport on the largest scale. It is the case no doubt that the Government of India has a large surplus of war stores of its own to dispose of, but even so there will be room when it has all been sold for some portion of the splendid fleet of motor vehicles which the Imperial Government possesses and for which it must find a purchaser. A point to be remembered is that these motor conveyances will be purchaseable at a price far below the scale of charges which will obtain in private industry for a very long time to come. Moreover, if sold to foreigners they will help to

strengthen the competition which we shall have to meet in the difficult times ahead.

AERIAL BUSES.

Apropos of what I have written about aerial developments I may refer to an interesting interview which appeared in last Sunday's *Observer* on the subject of "Aerial buses." The person interviewed was Mr. Holt Thomas who has come into prominence of late in connection with the proposed scheme for instituting an aerial passenger service between London and Paris. Mr. Thomas outlined plans which embrace a world wide aerial mail service, establishing services with Italy, France, Norway, India and South Africa with a chain of aerial stations extending at intervals of every ten miles all over the world. The machines used for this work will be the famous weight carrying flyers which have come into prominence of late in connection with the bombing of German towns. These planes fly 128 miles an hour, carry a weight of 3,250 lbs. and climbs 5,000 feet in five minutes. On the question of actual flying speed under new conditions Mr. Thomas made some interesting remarks. He said:—"In the paper I read before the Royal Aeronautical Society in May, 1917, I took as a safe actual speed eighty miles an hour. We could, I think, now take 100 miles, as we have machines doing 130. But taking the same figure, of eighty miles an hour, Rome can be reached by aerial service in twelve hour and a half from London instead of forty-two hours by the quickest route before the war, and Constantinople in twenty hours instead of in seventy-two. At the same speed, which I think is under-estimated on to-day's conditions, Bombay is about two days' journey by air from London and Tokyo four or five days." It is hardly necessary to comment on this statement. It so eloquently tells its own tale of what we may expect in the future. But I may add that our occupation of mesopotamia will enormously facilitate the establishment of aerial communication with India. In the Euphrates Valley we shall find ideal sites for our aerodromes and a direct line between London and Bombay passed down this valley. As to passenger traffic the fact that the aerial route will be about 1,000 miles shorter than the sea journey will inevitably tell in its favour.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Making a Telescope out of a Camera.

Washington, D.C., U.S.A., 12th December, 1918.—Few camera owners are aware that they possess in their instrument the essential parts of a telescope—namely, a small lens in the view finder to serve as an eyepiece and the photographic lens to serve as an objective.

Remove from the finder the small lens found there, the focal length of which is usually about '8 of an inch. Unscrew the front component of the photographic lens system. This can be done while the camera is "loaded." Choose the distant object to be observed; then, holding the finder lens close to the eye bring the photographic lens into alignment with the finder lens and the distant object, moving the photographic lens slowly to and fro until the distant object is seen, sharply defined and magnified. Adjustment is easily maintained if the hands grip a small stick. The magnification depends upon the focal lengths of the two parts of the telescopic combination. For distant objects the magnifying power is obtained by dividing the focal length of the photographic lens by the focal length of the finder lens. The focal length of a lens is the distance from its center to the point at which a system of parallel rays will come to a single point or focus. This distance is easily found with sufficient exactness by using the lens as a burning glass in sunlight and measuring the distance from the lens to the burning point, or image of the sun.

On popular types of camera the front lens often has a focal length around 12 inches. When used with a finder lens of '8-inch focal length the improvised telescope thus has a magnifying power of 15 diameters, and an object 15 miles away, therefore, appears one mile distant.

In the less expensive cameras no component of the photographic lens is readily detachable, and films or ground glass, as the case may be, must be removed, leaving the back of the camera open. To use as a telescope, the camera, with shutter wide open, is pointed at the distant object, and the finder lens is held before the eye at the rear of the camera.

Since converging lenses are used in the finders, an astronomical type of telescope results, and objects are seen inverted—a feature which, it is said, is not necessarily confusing. To avoid this one may, if he wishes, carry in his pocket a small diverging or concave lens. Using this instead of the finder lens he will obtain an erect image as with an opera or field glass.

AMERICAN-MADE INDIGO SOLVES DYE PROBLEM.

Indigo, the key to the dye situation in this country, now is being produced in the United States in commercial quantities, and the solution of the American dye problem—acute since the imports from Germany were cut off—has been found. Not only is America now independent of Germany, but we are rapidly moving into a position to hold the dye trade of the world, or at least the dominating place in that trade.

The dye problems have been solved, and United States laboratories are at this moment turning out synthetic indigo of the best quality on such a large scale that the commercial success of the undertaking is quite assured. As a matter of fact, the laboratory problems were all solved long ago. The manufacturing difficulties now have been overcome, and the production of this most important factor in the dye industry is going along according to the most up-to-date process. Not only is indigo being made in large quantities, but plants are turning out all of the intermediates necessary for its production. In a very short time the United States indigo plants will be brought to their

full capacity, which will supply all of the needs of the United States and Canada.

In addition to the production of this indigo, a largely capitalized corporation soon will be manufacturing types of the finest basic, acid and direct colors, and a little later will put on the market the alizarine colors with their mostly needed derivatives—namely, the vat colors. Sulphur colors and chrome colors will be put on the market in a comparatively short time. While it is not possible at this writing to give definite dates, the plans are progressing very rapidly, when considering the difficulties of securing necessary machinery and raw materials, and it is certain that the United States will shortly be independent in all respects in the dye industry, and even in position to cultivate the markets of the world.

A FARMER'S CONVERTIBLE AUTOMOBILE.

A Maryland farmer uses a simple scheme for doubling the usefulness of his light two-passenger (roadster) automobile. It consists of a pair of auxiliary rear wheels, and a quickly detachable freight compartment, which is made interchangeable with the regular hinged-lid compartment provided on the car. The wheels were fitted up by a blacksmith. He made over two ordinary wheels by riveting a six-inch wide steel band around the tire rims. The band is studded with rivets, or projections, to secure traction. The diameter of these wheels is about six inches less than when fitted with tires and in consequence there is more pulling power, though at a somewhat reduced speed.

Equipped with the wide wheels and the freight carrier the car can travel readily on fields and roads that are impassable with the regular wheels. The farmer is enabled to bring in his crop from the fields to the storage houses or direct to the markets.

When the car is to be used for passenger carrying purposes only it is a simple matter to remove the body and wheels, and put on

the regular wheels and the original hinged-lid compartment.

CHEMISTRY BY WHOLESALE.

The United States Government has completed the world's greatest plant for manufacturing smokeless powder. The plant is composed of nine units, with an aggregate daily output of 900,000 pounds.

The "Old Hickory" plant, as this gigantic establishment has been christened, is what is known as a self-sustaining plant, combining all the features of the ordinary gun-cotton and smokeless powder factories. There are complete units for the manufacture of every ingredient that goes into either of these explosives, together with facilities for meeting some of the demands of other government powder plants. Each of the nine sections is practically complete within itself, isolated from the others for safety in the event of accident, and approximately eight times the size of the largest smokeless powder plant in this country prior to the war. The entire establishment is accordingly some seventy times the size of the largest factory of its kind we had in 1914.

It was, of course, necessary to build a town for the employees, and though some 12,000 of the workers will live in a nearby city (Nashville), and go back and forth each day, the population of the new community will be about 20,000. For those living in Nashville a special railroad has been constructed leading to the plant.

Some idea of the scale of operations may be had from the statement, that 5,000 tons of coal are consumed daily, together with a hundred million gallons of water—enough water for a city of a million inhabitants. Of this water, 65 per cent issued in the chemical processes for which it must be treated and filtered. The bare idea of 65,000,000 gallons of reactions per day is quite sufficient to make the laboratory chemist gasp, and should give him a clear understanding of why

it is that the manufacturer cannot always do, on a factory scale, the things which the investigator can accomplish with comparative ease in a test tube.

In addition to the railroad which is built into the plant, it has been found necessary to reconstruct the highways leading from Nashville; and within the plant itself many miles of standard and narrow gauge track are being operated. The plant contains about 35 miles of the former and 46 miles of the latter track.

TEXTILE SUBSTITUTES.

Extensive experiments are being carried on in the United States for the manufacture of bagging, packing material, cushion and mattress fillings, twine, rope, etc., from the straw fibre of barley, wheat or rice, according to the strength of the material wanted. The plant for working the straw is very simple and requires a steam boiler, receiving tanks of sheet iron and common wood, running water and sheds. The time required for transforming the straw into a fibre for weaving or spinning is stated to be about two hours. After passing through the water and steam process the product is dried and beaten simultaneously, then carded and lengthened. The machinery commonly used in the jute industry, with slight modification, is suitable for working the straw thread. To obtain a stronger thread the straw fibre may be mixed with jute in the proportions required—that is, for the coarsest grade 5 per cent of jute is used, and for the finest varieties up to 50 per cent. The product obtained by this mixture has been tested for its strength, and the resistance of the straw thread so worked has been declared by competent authorities to be comparable with that of jute. In view of the jute scarcity everywhere the lower cost of the new product, and the opportunity afforded of utilizing this straw, hitherto unused, the discovery bids fair to introduce a flourishing industry.

IMPROVISED WATER WHEELS.

Confronted by the possible loss of 4,000 acres of wheat in the State of California, due to lack of water, an ingenious engineer improvised four water-lifting wheels from odds and ends of machinery in the short space of twelve days and succeeded in saving the grain. In the engineer's favor was a canal running from a lake to the fields, which had been abandoned because of the excessive cost of pumping. Near by was a bariety of worn-out pieces of oli-pumping machinery.

Out of the familiar cable drums employed in connection with the oil derricks he constructed the water raising wheels, which were installed at as many points along the canal and set to running with tractors and other ranch machinery. The wheels were from fourteen to nineteen feet in diameter, and from four to five feet wide. They were driven by flexible chains instead of spur gears, thereby lessening the wear and tear on the equipment. In one case a centrifugal pump and a water wheel were operated side by side. The former delivered fifteen cubic feet per second as against eighty cubic feet per second delivered by the latter. Each was operated by a 45 h. p. engine. The marked difference in efficiency was accounted for, in part at least, by the loss of effectiveness which the pump sustained in accelerating the speed of the water. With the wheel, on the other hand, the loss was reduced to a minimum, inasmuch as the water was moved slowly. The largest of the wheels lifts 100 cubic feet of water per second, covering 400 acres of land with six inches of water in twenty-four hours. The engineer is now standardizing his makeshift water lifters and has greatly extended the region irrigated.

BEETS DUG BY NEW MACHINE.

An interesting and ingenious labour-saving machine has just been designed for harvesting beets. Mounted between two traction wheels is a novel third wheel having tines projecting radially through holes in the tire,

the inner ends of the tines being attached to a belt inclosing a stationary cam. As the wheel and tines revolve, the cam causes the tine ends to be thrust beyond the tire just as they strike the ground, piercing the beets in their path.

At the lower end of the adjustable frame in which the digging member is mounted is a V-shaped share which loosens the dirt below and on either side of the beets as the harvester is drawn along, so that the sharp prongs pull the vegetables from the ground very easily. On being swung part way around the wheel the beets are handily discharged into a conveyor by the withdrawal of the tines.

CHECKING SPREAD OF MINE EXPLOSIONS.

The method of localizing explosions in mines by throwing rock dust into the air, blast that precedes a dust explosion as it moves along a mine gallery, has been greatly improved by the invention of an automatic rock-dust distributor. It is claimed that it is unsafe to rely on the initial rush of air to distribute the non-inflammable dust in advance. The new apparatus consists of a dust container having a discharge spout at its lower end, and with two outlets of a compressed air tube installed in the device for the purpose of blowing the dust out. A valve on the spout is electrically controlled. A thermostat, which forms part of the electric circuit, is placed some distance from the container, and when a blast takes place the heat actuates the thermostat, causing the apparatus to begin scattering the dust before the flames arrive.

ALFRED T. MARKS.

NOTES.

In another part of this issue we print Extracts from Sir Harcourt's address made at the recent Convocation of the Allahabad University. The speech is a most suggestive one and will repay perusal. We would draw particular passage which occurs in it:—

"Our educational machinery is in part worn out and rusty, but still it has accomplished much. Faulty and make-shift as it necessarily has been, our education has made modern India. It has purified public services, it has increased the number of men who think it has prepared the way for new ideas and larger conceptions of civic duty. It has opened new avenues of employment; it will end, I trust, in growth and the spread of Imperial ideas. There are still great walls of ignorance to be battered down. There are many and great temples of education to be built up. There is a call for highest service from the best of India's sons but members have been stirred. Beginnings of desire for free and compulsory education are manifest, great hopes thrive and grow. In a short time we have fulfilled a long time. Even before the war new ideals of educational policy were in the air and war has changed the aspect of policy such as a stream of lava changes the country at the base of some great volcano, or a tidal wave changes some island in the Pacific Ocean. The war has broken up the despotism of humanities and has installed a federation of sciences and humanities. This is a great master change. For centuries education has, to use Macaulay's phrase, disclaimed to be useful. It must be useful now. And, yet one may hope humanizing of science. The scientific use of humanities will go on side by side. No mere materialistic education will ever satisfy India. Over and above us all towers the peak of sheer educational power, over us all is still cast the spell of ideal."

The Irrigation Administration Report of the United Provinces for the year ending 31st March, 1918, says that the area irrigated by all canals was 3,209,425 acres, which is 297,334 acres more than that irrigated in the previous year, and 68,309 acres in excess of the average area irrigated during the three years ending 1916-17. There was an increase in the area of all crops irrigated except in the case of the inferior food grains. The sugar-cane area of 365,605 acres is the highest record, the increase being 5,639 acres over the next highest on record in 1912-13. The area under wheat was 934,760 acres or an increase of 75,252 acres compared with the area irrigated in the last year. The area is however 53,404 acres less than that irrigated in 1905-06; and 123,871 acres less than the record area irrigated in 1899-1900. The indigo area irrigated was 156,543 acres which is an increase of 30,719 acres over the area irrigated in 1916-17, and an increase of 140,093 acres as compared with the average area irrigated in the ten years ending 1915-16.

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The following Statement prepared in the Department of Statistics, India, shows the quantity and value of Cardamoms imported from foreign countries by sea into British India during November 1918:—

Articles and countries of consignment.	November 1918.	
	Quantity	Value
Spices—		
Cardamoms—	lbs.	Rs.
Ceylon	3,891	2,555
Hongkong	910	731
Total	4,801	3,286

The following Statement furnished by the Department of Statistics, India, shows the quantity and value of Milk, condensed and preserved, including milk cream, imported by sea into the different maritime provinces of British India during November, 1918:—

Share of provinces.			Quantity	Value
			lbs.	Rs.
Into Bengal	...	...	144,705	88,395
„ Bombay	...	...	831	418
„ Sind	...	...	18	28
„ Madras	...	...	23,104	14,662
„ Burma	...	...	188,899	95,457
Total			357,557	1,98,960

According to the *Board of Trade Journal*, a Permanent Bureau for Standardisation in the Netherlands is to be established. It is recognised that one of the means for enabling various branches of industry to compete after the war will consist in the standardisation of constructional parts, with a view to the more economical manufacture of such parts in bulk.

Mr. A. Barnett-Saunders, who was one of the prisoners at Ruhleben from the beginning of the war, compiled while there a large number of extracts from German publications dealing with the provision of Ersatz or substitutes for all manner of things. The manufacture of these articles went to great lengths. One of the German comic papers made a Berliner ask 'Why was Meier fined so heavily?' His friend replied, 'Because he adulterated the imitation of a substitute for a substitute for jam.' Familiar by now is *Kaffee-Ersatz*, made out of acorns and horse chestnuts, but there were also 'acorn coffee,' 'lupins as coffee substitute,' 'carrots as coffee substitute,' and a coffee

substitute from beet-root. When the ersatz could no longer be produced 'an ersatz for the ersatz' sprang into existence. There was 'artificial honey' and then 'artificial honey substitute.' Washers for taps gave out: the ersatz failed and there appeared a 'substitute washer substitute.' Among the substitutes *Wermuth-Wein Ersatz* figured, containing 98 per cent water and only 2 per cent of colouring and tasting matters. A caricature of these substitutes showed two rabbits, and bore the inscription, 'We are now substitutes for pigs, and must learn to grunt.' Often the motive prompting the issue of these ersatz was bare-faced commercial exploitation of the German masses.

The following is from the Bengal Government Order reviewing the Report of the Bengal Agricultural Department:—The continued rise in the prices for home reeled silk is reported to have resulted in a considerable increase in the area under mulberry in Bengal. The effects of improved prices are also show in the financial results of the supply of seed-cocoons from the Government nurseries, the receipts for the nine months under review being Rs. 32,563 compared with Rs. 16,829 and Rs. 28,737 in the full years 1915-16 and 1916-17. Nevertheless Babu A. C. Ghosh, the Superintendent of Sericulture reports that the silk industry is rapidly disappearing in Bogra District on account of the high wages of labour and the superior attraction of Jute. Sericultural work has continued on the same lines as in previous years. The new features of the work were the introduction of the more accurate method of detecting pebrine in moths advocated by the Imperial Agricultural Bacteriologist, and the setting apart of the Sericultural Nursery at Berhampore for testing on a practical scale the races of silkworms which have been reared by Mr. P. C. Chadhuri, who is carrying on M. Grangeon's work, and by Miss Cleghorn. The results of these trials will be awaited with great

interest. The Governor in council has not yet received the opinion of the Provincial Silk Committee on the recommendations of Mr. Lefroy, late Imperial Silk Expert.

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A Press Communique, dated Delhi, the 29th January 1919, says:—A telegram received by the Government of India from the Right Honourable the Secretary of State for India announces that the export from the United Kingdom of the following articles is now permitted without license:—Manganese and manganese ore; Manganese peroxide and ferro-manganese; Tungsten ores; Flax and linen goods; Hemp of all kinds; Sandal-wood for medicinal purposes; Sandal-wood oil; and Mahogany and hardwoods. A general import license, valid till 1st July, has been issued for the import into the United Kingdom of:—Cassia lignea; Hides, wet and dry; and Pimento. It is also stated that the existing general license for the import of the following articles will be continued until the 1st July 1919:—Bladders, Casing and Sausage skins; Coffee; Horns and hoofs; and Tobacco (manufactured and unmanufactured) including cigars and cigarettes.

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A Press Communique Delhi, January 30, 1919, states:—The conditions created by the war have emphasised the great importance of an investigation of the fibre resources of the Empire, and India with its present monopoly of jute cultivation and its wide variety of climatic conditions offers a promising field for investigation. The necessity for increasing the cultivation of flax, for instance, has already been recognised, but enquiries have shown that further experiments are necessary before a considerable increase in the cultivation of this crop can be effected, and detailed investigations are required to ascertain how the production of other useful fibres can be increased. Since 1907, the labours of Mr. R. S. Finlow, fibre

expert with the Government of Bengal, have been mainly concentrated on jute, and his activities have been geographically limited to the provinces of Bengal and Assam, with occasional visits to provinces where jute experiments are in progress in order to observe results and to offer advice. It has now been decided to extend the scope of Mr. Finlow's work with a view to the thorough exploitation of the fibre possibilities of India. Mr. Finlow's investigations will extend throughout India. His duties under the scheme will be purely advisory and his head-quarters will remain at Dacca in order that his important work in connection with Bengal jute may not be interrupted. Experimental work will be carried on through the local Agricultural Departments, and manufacturing tests will be conducted at the Agricultural Research Institute at Pusa in collaboration with the Imperial Agriculturist. The scheme as outlined above will take effect from the 1st February, and will be continued for the present for a period not exceeding two years.

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The fourth meeting of the Industries Section of the Board of Industries was held at Allahabad on 23rd January 1919. Amongst the items dealt with was the question of granting loans to passed students of the Central Weaving Institute, Banares, to enable them to purchase looms and accessories to carry on their occupation as weavers after finishing their school course. The scheme had the approval of the Board and was recommended to Government.

SPEECHES AND PRONOUNCEMENTS.

BENARES HINDU UNIVERSITY.

H. H. The Maharaja's Speech.

The following is the text of the speech delivered by H. H. the Maharaja of Mysore at the recent University Convocation at Benares:—

Your Highness the Pro-Chancellor, Mr. Vice-Chancellor, Ladies and Gentlemen,—I esteem it a high privilege to preside at the first Convocation of this University in the presence of such a distinguished gathering. Although the distance of Benares from my own territories does not permit my visiting the University as often as I could wish, or associating myself very closely with its affairs, yet, believe me, I shall always take the deepest interest in its welfare and shall recall with gratification the great honour which the University authorities have paid to me in selecting me as their first Chancellor.

The history of the Benares University illustrates the unwearying courage of the leaders of the movement; their capacity for sustained effort, their co-operation and their powers of organization. To-day we may recall with pride and gratitude the pioneer work of the illustrious promoters of the Hindu University movement—His Highness the Maharaja of Benares, the Maharaja of Darbhanga, the Hon'ble Pandit Madan Mohan Malaviya, who has dedicated his fine talents to the service of this institution and to whose devotion and untiring labours the scheme mainly owes its inauguration, Mrs. Besant, who placed at our disposal a fully organized College which enabled us to make an early start, their Highnesses the Maharajas of Gwalior, Kashmir and Bikanir, and others whose services will ever live in the memory of our people.

Of the many important measures which distinguish the viceroyalty of Lord Hardinge, not the least in its beneficent and far-reaching effects is the Benares Hindu University Act of 1915, by which the Government of India, under his inspiration and guidance, set the seal of its approval upon one of the greatest popular educational movements of the times. Lord Hardinge thus earned the eternal gratitude of the Hindus by generously permitting the establishment of an institution upon which the entire community had set its heart, and I have no doubt that the

foundation of the University was well and truly laid by the hands of one who sympathised so deeply with Indian needs and aspirations. Nor should I omit, on this occasion, to acknowledge, with gratitude the conspicuous services rendered to our cause by Sir Harcourt Butler, who was Educational Member of the Government of India at the time when the Act was passed, and who still maintains a keen interest in the affairs of the University. I grieve to think that this young University has suffered, so early in its career, two serious bereavements—one by the death of Sir Sundar Lal, its first Vice-Chancellor to whose untiring exertions it owes much of its initial success, and, the second, by the death of His Highness the Maharaja of Jodhpur, whose princely munificence enabled it to proceed with the organization of the important department of Technology. There is not one of us here who does not feel that this occasion has been saddened by the absence from our midst of these two notable benefactors.

After many vicissitudes and many years of toil, we are assembled here to-day to gather the first fruits of our labours, and this important event in the history of our University comes happily at a time when the most terrible war that the world has ever seen, is at an end. We rejoice on such an occasion to congratulate His Majesty the King-Emperor and the British Nation on the decisive victory of the British Empire and its Allies. The war has demonstrated the greatness of the British character, no less than the deep rooted loyalty of the Princes and people of India to the British connection. May we hope that the outlook of the human race is changing, and that a new era is dawning on a world saddened by the tears and sacrifices of many nations—an era of the reign of right as opposed to might, of principle as opposed to expediency, and of peace as opposed to aggression.

Though, as the recent war has shown us, it does not necessarily follow that every increase of knowledge is accompanied by a betterment of conduct, still, the doctrine that knowledge is virtue, is one to which our Vedanta gives support when it attributes sin and downfall to "Avidya" or ignorance and sees in "Vidya" or enlightenment, the

liberation and perfection of the soul. Therefore, centres of culture like this University have a noble purpose to serve, and can contribute materially to the enlargement of human ideals and to the promotion of inter-racial and international fellowship. But they can achieve this end only if their outlook is as wide as humanity itself.

This University is the most striking manifestation of India's effort at self-determination and self-expression. It is, or it ought to be, the embodiment of the very soul of Hindu India, her noble tradition, elevating impulses and devotional culture. It is the first private University in the country as contrasted with Government foundations, and it has, for that reason, possibilities of freedom and self-development peculiarly its own. Along with the project for the Aligarh University, which I sincerely trust will soon be an accomplished fact, it has done much to quicken the confidence of Indians in their capacity to take independent charge of education in all its grades and is entitled, in no small degree, to the credit of having ushered in a new epoch in the history of higher education in India—an epoch marked by the foundation of compact unitary Universities of the teaching and residential type, organized and administered by Indians and adjusted, in varying degrees of completeness, to the special conditions, requirements and aspirations of Indians.

In all our future efforts, however, we should always bear in mind the noble ideal which was set forth in the Address presented to Lord Hardinge on the occasion of the ceremony of laying the foundation stone of the Hindu University, that, in order to preserve and promote our distinctive civilisation and culture, and to instruct our youth in the sacred precepts of religion, it was necessary to build up an ideal University which would seek to combine the practical efficiency of the modern system of education with the high spiritual ideals of ancient India. Especially should we Hindus, with our glorious past, beware of the temptation to confuse patriotism with blind adoration of ancient days, coupled with a feeling of repugnance for everything modern and foreign. No nation is impoverished by commerce with other nations; no civilisation can suffer by intercourse with other civilisations and by an intelligent assimilation of the principles, ideas and practices that have proved to be beneficial to other peoples and countries. I trust, therefore, that the Benares University will gather the fruit of all ages and countries, will keep abreast of modern progress and will bring up her children to become healthy and strong and well-fitted to remould the destinies of India on sane, yet progressive, lines.

The very location of this University, in the ancient sacred capital of Hindu India, which has maintained unshaken its spiritual sway through all changes of history, constitutes an inspiration, both remarkable and unique. There is a magic and enchantment about the very name Benares which thrills the heart and fires the imagination, setting in motion a long train of ennobling, patriotic and spiritual memories. Such sentiments should not, however, be developed to the prejudice of a liberal culture which sets its face against sectarian strife and jealousy while keeping its individuality. The Benares University should develop such a culture in its widest sense as the embodiment of a New and United India, and should aim at a definite preparation for citizenship, in the largest sense of the term, as one of the principal objects to be pursued. This will include moral education or training of character. I understand that, in America, where the problem of fusing a variety of peoples into a common nationality is as urgent, though perhaps not so difficult, as in India, education in citizenship, patriotism and loyalty to the constitution have been included amongst the objectives of the school system. The cultivation of the ethics of citizenship and patriotism is specially needed in India, where clan, tribe and caste have had a deplorable tendency to produce communal exclusiveness and differences. I trust that the compulsory education in Hindu religion and morals, which is a feature of this University, will result in the promotion of a liberal culture of the type contemplated above.

Besides, we have to bear another factor in mind. The modern age is characterised by the knowledge and cultivation of the physical sciences and by their increasing application to the methods of economic life. Scientific knowledge and economic progress go hand in hand, and form the very foundations of national life, and, unless we achieve both, we are bound to fall behind in the march of progress. This University should, therefore, address itself to the development of its modern side by organizing such practical faculties as those of Technology, Applied Chemistry, Agriculture and Commerce, so that trained talent may be available in the country for the development of its vast and varied material resources. Let the University turn out a new type of learned men, who will be fit to be the captains of our Commerce and Industry, leading the country along the paths of a sound economic advance and winning for her a leading place in the international industrial struggle.

There are some people who think that India is becoming over-educated, and who point to the large number of students seeking admission into the

different Universities and to the glut that there is in the market for their services as reasons for their belief, but compared with foreign countries, the number of people who have any education in India is deplorably small, those possessing higher education is smaller still, and there seems to me to be no justification for regretting an increase in the number of our graduates. But all the same, there must be some good reason somewhere for the distrust and suspicion with which the overflowing of schools and colleges is looked upon by some friendly critics. I venture to suggest that the real trouble is not over-education but mis-education, by which I mean the giving of the wrong kind of education. Doubtless, in early days, the necessities of Government Service had a predominant influence in determining the extent and character of the education given in India, and the evil complained of, *viz.*, mis-education, is due to the insistence on a type of education which is no longer suited to our conditions, which has been outgrown in most other countries and which requires to be altered in accordance with the larger conceptions of education now prevailing. One of the inevitable results of this policy is the fetish which is still made of Government Service, which is the "be all" and "end all" of a majority of the graduates who leave our Universities. It looks a simple truism to say that popular education cannot in all points be similar to education intended for a limited purpose, or for a limited class, but it is the neglect of this truism that must be held to be responsible for one unsatisfactory aspect of education in India. The more popular a system of education is, the more thorough should be its impregnation with the industrial spirit, which will also have the further effect of giving the precept regarding the dignity of labour more reality, than it has possessed so far in India.

It is gratifying to find that the Benares University has already recognised the importance of Technology, and has made preparations for the formation of a Faculty in this subject. In this connection, we may gratefully acknowledge the princely donation which has been given by His Highness the Maharaja of Patiala in aid of the Department of Technology. I trust that the steps taken to establish the Faculties of Agriculture and of Technology will soon lead to tangible results. This country will, I am sure, realise that to equip and conduct a Technological Faculty on up-to-date lines, keeping pace with the improvements in the mechanical arts and sciences that are effected almost day by day, will cost a great deal of money, and that it will not be possible to carry on operations successfully unless the funds at the disposal of the University for this purpose are vastly increased.

I would like to say a few words to the new graduates, and specially those who are about to leave

the University. I would impress on you, in the first place, the importance of discipline in schools and colleges and of self-disciplining in after-life. There is no walk in life in which the observance of discipline is not essential to success. No army can fight without it, no athletic team can succeed in which discipline is not observed, no Government administration or business firm can "carry on" unless those members of it, whose duty it is to obey, submit themselves loyally to their leaders and so learn in time to command others.

Finally, I would impress on you that you should endeavour to combine in your lives a real sense of religion with true culture; to believe that you owe a duty to God and to your fellow-men, and to aim at faith without fanaticism, difference without weakness, politeness without insincerity, and, above all, integrity of character in thought, word and deed. The ideal is a high one, but you can at least try to live up to it. But even this is not enough. The country needs something more virile than the accomplished gentleman. It needs men of enthusiasm, even more than refined intellectuals pursuing the easy path of wordly wisdom, wordly compromise and wordly success. It needs men of stout hearts and strong hands, who will not allow their conscience to be drugged by sophistry of any kind, or their nerve to be paralysed by the fear of unpopularity, but will oppose wrong whenever found, and fight unflinchingly the battle of social justice and emancipation, on behalf of the weak and down-trodden. Like the Gurukula at Haridwar, every Indian University should aim at sending forth men filled with intense patriotism for service, and with zeal burning in their hearts. Indian Universities will be judged by two standards, firstly, by their contribution to discovery, invention and the expansion of the field of science and art; and secondly, by the number and the quality of the men whom they send forth, filled with a genuine devotion to the good of India and to the service of their fellow-countrymen of all grades and ranks, irrespective of caste and creed. I have every confidence that the Benares University, itself the child of patriotic labour and sacrifice and the inheritor of the highest traditions of a spiritual people will be able to satisfy both these tests, and will take a foremost place amongst the influences that make for light and leading in our ancient and beloved Motherland.

It is my earnest hope—a hope which I know will be echoed by millions of my countrymen—that the Benares University may not only be an object of special veneration and solicitude to the Hindus, but may also attract, by the quality of its secular education, young men of all religious persuasions in India. The institution should be Indian first and Hindu afterwards. The graduates who receive their degrees to-day are a handful, but their number is destined to grow. I look forward to the day when young men from all parts of India will fill these lecture halls and, after completing their education, will go out skilled and capable, and equipped both mentally, morally, and physically to fight life's battles as citizens of this great country. If wisely guided, the University should, in due course, become a truly national institution of which every Indian, whatever his race or creed, might be justly proud.

INDUSTRIAL CONFERENCE.

MR. PETIT'S PRESIDENTIAL ADDRESS.

Criticism of Industrial Commission's Report.

The following is the presidential address of Mr. Jehangir Bomanjee Petit, delivered at the fourteenth session of the Indian Industrial Conference held at Delhi on 30th December, 1918:—

Mr. Chairman of the reception committee, brother delegates, ladies and gentlemen.—

I thank you very sincerely for the great honour you have done me by inviting me to preside over your deliberations.

In spite of the fact that the notice given to me was exceedingly short, which circumstance unfortunately in my case, was rendered more difficult by the consciousness of my own limitations, I have considered it an honour to respond to the call of duty—though not without diffidence, I admit—in the confident hope that I shall have your valued co-operation and consistent indulgence in the adequate discharge of the responsibilities devolving upon the president of an important all-India organization of this character.

Although I come of a family of merchants and industrialists, and am one myself both by inclination and persuasion, and am therefore in a position to accurately measure and appreciate the important part played in the progress and regeneration of a country by its commerce and industries, I emphatically declare that I am not one of those who think that the industrial development of a country is more important than and must have precedence over, its political emancipation. I hold that a country, in order to be industrially great, must first be politically free. It must breathe the air and exist first before it can embellish its life. It was more than 33 years ago that our great national movement with its political programme in the forefront, was inaugurated by, and under the guidance and leadership of the first-guard, which unfortunately is now gradually disappearing. Since then the country has readily and very properly accorded it the place of honour and always regarded it as the first child of our national movement. Even in these days of aggressive and scientific industrialism and in spite of our enthusiasm

for the creation of an industrial India, I am certain that the country as a whole would not be prepared to deprive the first-born of its rights and privileges of primogeniture.

The Indian Industrial Conference was started in the year 1905 as an adjunct to the Indian National Congress, and has with her elder sister made the modern history of India. The movement has done very valuable work in the past; but if it is to keep pace with the exacting requirements of modern times and fulfil all that is still expected of it—and it is much—it must be properly recast; its constitution entirely reshaped, and its administrative and executive machinery, adequately equipped. In fine, it should be made into a living and active organization, with plenty of creative and propelling force behind it. I notice in the report of the proceedings of the last year that a representative committee was then appointed to determine *the future lines of the work of the Conference*; and I do sincerely hope that the report of this committee will be such as will justify the high hopes placed in the Conference for the future.

The fourteenth session of the Conference, which we are holding to-day, is rendered memorable owing to the occurrence during the year under review of at least three events of stupendous importance to the industrial future of the country. These are (a) the Montagu-Chelmsford Reform Proposals; (b) the Report of the Industrial Commission; and (c) the termination of the world-war. The first promises liberty and holds out hopes to the Indian people to develop in their own way by bringing about a steady reform in existing conditions. The second indicates the line of development so far as the industrial side of the question is concerned. The third offers numerous opportunities for development, in consequence of the subdued and sympathetic atmosphere created by a fortunate combination of forces, non-existent and even unthinkable in pre-war days.

As this Conference is directly concerned with the effects of the report of the Industrial Commission,

I offer no apology for selecting that out of the list I have mentioned for dissection and careful examination. In view also of the fact that the said report covers the entire range of commercial and industrial subjects which can be, and in the ordinary course of events, would have been dealt with by the Conference, I am sure you will understand why I propose to confine the rest of my address to this important and all-absorbing topic.

INDUSTRIAL COMMISSION'S REPORT.

Broadly speaking, the report indicates a welcome change in the hitherto apathetic attitude of the Government towards the industrial needs of the country and 'the definite adoption of a policy of state participation in Industrial development.' It is a sad commentary on the statesmanship of the Government of this country that an unprecedented world war with all its horrors was necessary to open its eyes to the utterly helpless condition of economic and industrial dependence to which by its conservative, self-centred and I am sorry to add, in many respects, unrighteous system of administration, India has unfortunately been reduced.

The report of the Commission covers so wide a range of questions and is so comprehensive in its scope that I am sure you will readily admit that it would be difficult to deal with it exhaustively in the short time at my disposal. I shall, however, endeavour to speak of the principal features thereof as briefly as possible; and venture to offer constructive suggestions for such action as may happen to appear to be the most urgent need of the hour.

After exhaustively dealing with the various factors that have operated against the successful industrial growth of the country, the report comes to the perfectly correct and inevitable conclusion that '*a powerful and well-directed stimulus is needed to start the economic development of India along the path of progress*;' and adds that '*such a stimulus can only be supplied by an organized system of technical, financial and administrative assistance*'. In brief, the principal constructive proposals made in the report, in the language of the report itself, are the introduction of a system of technical education in practical relation to industrial requirements, the supply of advice and assistance through organized scientific and technical services and the provision of more liberal finance for industries, so far as possible through private agency.' The administrative machinery proposed by the commission to put these recommendations into effect, consists, mainly of the creation (a) of Imperial and provincial departments of industries; and (b) of two new services, viz., the imperial industrial and the imperial chemical.

The recommendations also include the provision of (c) provincial industrial and technical schools; (d) technological provincial institutes; (e) institutes for the training of mechanical engineers; and (f) workshops and laboratories attached to the the Imperial and Provincial Directors' Offices.

Also the following schemes as possible ones :—

- (1) A Central Engineering College;
- (2) A Metallurgical Institute at Sakchi; and
- (3) A Central Chemical Institute.

(a) Personally, I have always held that the lack of an industrial executive is inimical to industrial progress; and I therefore all the more readily welcome the proposal of the creation of Imperial and provincial departments of Industries, made in the report, as the first step towards the realization of the two main principles now definitely accepted by the Government and unequivocally referred to in the report as follows :—

- (1) 'That in future Government must play an active part in the Industrial development of the country, with the aim of making India more self-contained in respect of men and material; and
- (2) that it is impossible for Government to undertake that part unless provided with adequate administrative equipment and forearmed with reliable scientific and technical advice.'

The idea of centralising the imperial department under a separate member with a seat in the executive council, to co-ordinate and direct the general industrial policy of the country, is in my opinion, a very good one. There is no doubt a sufficient number of closely allied functions to justify the creation of a specialised imperial department in their performance. I am equally certain that if properly manned and conducted in the right spirit, a separate Imperial department for industries will before very long be able to achieve, with regard to the numerous far reaching questions that are sure to arise regarding industrial development, what neither the present revenue and agricultural departments nor even the present department of commerce, can or has been able to do.

I cannot help saying, however, that I agree with my friend and our distinguished countryman, the hon. Pandit Madan Mohan Malavia, in thinking that instead of the proposed Imperial Executive Board of Industries, an advisory board similar to that proposed for the provinces should be constituted, consisting largely of elected members, for reasons set forth by Pandit Madan Mohan in his very able minute, with most of which I am in substantial agreement.

(b) So far as the two services proposed and the other appointments contemplated in the report are

concerned, I am of opinion that they should be reserved exclusively for Indians. Taking into account the country's previous unpleasant experience in connection with appointments to lucrative posts, and having special regard to the fact admitted in the report that 'there will be similar post-war demands made at home and in the dominions for scientific, especially chemical, experts which will render it difficult to obtain suitable recruits from England,' I venture to think that the step that I propose, is not altogether without force. I am open to admit, however, that there may be occasions on which the requisite talent may not for the moment be available in the country; and I am prepared to grant that under such exceptional circumstances—but only under those—really capable and highly specialised experts may be brought out from abroad on the distinct understanding that their appointments should be for short periods only, and with the additional proviso that they should train our own men in the technique of their work. In this connection a passage quoted by Pandit Madan Mohan in his minute of dissent from the written evidence of Mr. Gibbs, the general manager of the Tata Hydro-Electric and Power Supply Co. Ltd., is of special interest. Says Mr. Gibbs:—

'No man should be imported into India unless he is a recognized expert in his particular line. He too should be engaged on short-time contract and made to understand he is being engaged and paid to teach our local men just as much as to introduce and to carry on his work. The young man from abroad who is educated but inexperienced, should not be brought to India and allowed to get this practice here.'

How raw and sometimes even worthless young men are often brought out to this country as experts and specialists, without the remotest title to these appellations to the unjust and continued exclusion of indigenous talent even of a very high order, is a fact too well-known to be dilated upon at this time of the day. As a glaring instance of this pernicious system, I may refer to the fact that in the recently established Munitions Board, out of 250 officers only three are Indians and even these have been appointed only to the posts of assistant controllers.

THE TWO PROPOSED SERVICES.

I regret to say that I am unable to agree with my friend the hon. Pandit Madan Mohan Malaviya that the creation of the two proposed services should be delayed for the present; although I think with him that, simultaneously, such materials, labour and capital as are available in the country, should be utilized to the best purpose by all means in the power of the Government with the help of imported

machinery and technical expert knowledge. It must be remembered that there is hardly an industry of any importance that does not already exist in the country in one form or another. The question is only that of the application of technical and scientific skill and of financial stability. In my opinion, the services recommended in the report, are likely to prove of immense value to the country immediately they are created. We must not forget that it is as important to introduce new industries as it is to improve and perfect old ones. I recognize the value of making an immediate beginning by liberally drawing for the moment upon foreign countries for machinery and other technical appliances, as also for real experts as first managers and other technical workers, and getting our own men gradually trained up under them. It was by means of such a system that the Indian Textile Industry has been built up and it is again by a similar method that Sakchi—the place where the great Tata Iron and Steel Works are established—is gradually developing into the Pittsburgh of the East. I have absolutely no objection to our beginning our industrial efforts in this way; but what I do object to is that we should remain satisfied with such improvised methods. The proposed services, if properly manned, efficiently worked, and directed by the future reformed, and I hope Indianized Councils, will, in my opinion, give an impetus to the industrial movement in a decade which the other system, however good for a beginning, will not give in a century.

I cannot too strongly condemn the unwarranted view often expressed by ignorant and irresponsible people and which Pandit Madan Mohan tells us, was even urged by many European witnesses before the Commission 'that India is, and must, remain mainly an agricultural country, that the people of India are in the nature and tradition deficient in industrial capacity and commercial enterprise, and that these qualities are inherent in the nations of the west.' Inferentially, we are asked to conclude that it would be extremely difficult if not impossible to produce not only practical industrialists in this country, but also such experts as may be needed for manning the various departments and services I have already referred to. In his admirable minute of dissent, Pandit Madan Mohan Malaviya has with brutal frankness and with a formidable array of unimpeachable facts and figures, mercilessly exposed this absurd and now exploded theory; and conclusively shown how India was at the height of industrial efficiency and was the supplier of many of the costliest necessities and most coveted luxuries of the world, when Europe, even including England, was in a comparatively backward condition. In the

report itself, we are told how at a time when the west of Europe, the birth place of modern industrial system, was inhabited by uncivilized tribes, India was famous for the wealth of her rulers and for the high artistic skill of her craftsmen.' Pandit Madan Mohan in his minute, by numerous quotations from great and eminent authors shows how 'the skill of the Indians in the production of delicate woven fabrics, in the mixing of colours, the working of metals and precious stones, the preparation of essences and in all manner of technical arts from early times enjoyed a world wide celebrity'; how Babylon traded with India as far back as 3,000 B. C.; how 'mummies in Egyptian tombs dating from 2000 B. C. have been found wrapped in muslin of the finest quality'; how the large and growing consumption in Rome of the finished products of the art of India, costing enormous sums of money, aroused the indignation of the elder Pliny; how 'the Hindus knew the art of smelting iron, of welding it and of making steel'; how cannons of the largest calibre were once manufactured in Assam; how 'Indian "Wootz" or steel, furnished the materials out of which Damascus blades with a world-wide reputation were made'; how Indian steel was in considerable demand for cutlery even in England; how the arts of spinning and weaving for ages successfully flourished in the country and afforded employment to a numerous and industrial population; in brief, in the eloquent words of the historian Murray, how 'its fabrics, the most beautiful that human art has anywhere produced, were sought by merchants at the expense of the greatest toils and dangers.' I refuse to believe that the inheritors and successors of a civilization at once so industrially advanced and so great, cannot produce the requisite material for manning and conducting the different services created under the report; and even for ultimately developing a strong and stable structure of industrial and commercial enterprise leading up to the establishment 'of industries where the capital, control and management should be in the hands of Indians.' As in every other sphere of life, so in the industrial world, I hold that, given the same conditions, the Indian is as intelligent, as capable, as efficient, as artistic, as constructive, as imaginative, as creative, as laborious, and as honest a human factor, as any existing in the world.

On some matters of vital importance on which the public was entitled to expect the report to lay down definite lines of action, the Commission have unfortunately shirked responsibility and recommended the appointment of expert committees to work out the necessary details. A number of committees have accordingly been suggested and Government have been asked to rely on their reports when ready.

Among others, even such important questions as the establishment of industrial banks, and of a research institute, have been entrusted to committees.

Notwithstanding this, many useful suggestions and indications have been made under various heads, such as the establishment of 'key industries' as a national necessity; the development of sugar, silk, and salt-petre industries; the provision of technological investigations encouraging the production of hide and leather; the provision of direct financial aid by Government to industrial enterprises in the form of guarantees on dividends, loans of money, undertakings to purchase output, or contributions to share capitals; the encouragement by Government of cottage industries and of co-operation in such industries; technical assistance to industries by Government including pioneering and demonstration works; the establishment of scientific and technical societies on the lines of similar institutions in England; the development of commercial education; a more thorough compilation and publication of commercial and industrial intelligence; the prevention of the adulteration of foodstuffs and drugs; the simplification of mining leases and the publication of mining manuals; the strengthening of the Geological Department, and the improvement of existing water-ways.

The idea of having an Imperial Department of Stores under a controller-general in India, made in the report, has, much to commend it, as during the duration of the war, India has shown her capacity to supply many of the most important requirements of Government departments. The report also takes a good survey of the available raw materials and of the possibility of developing forest resources, minerals and fisheries. The importance of scientific agriculture is also recognized and its introduction advocated. The sources of power, which exist in India, appear also to have been carefully considered, and important suggestions for their commercial utilisation, and particularly hydro-electric power, are made in the report.

The recognition of the urgent necessity of providing primary education for the artisan and labouring classes; and the recommendation for the introduction of a system of compulsory education for all classes of children, also form the welcome features of the report.

The report also recommends the appointment of a committee to consider the establishment of a school of navigation and Marine engineering. I would at the same time insist upon Government giving assistance to ship-building; and hope that the coasting trade of India will only be allowed to British bottoms.

MANAGEMENT OF RAILWAYS.

The total absence in the report of definite recommendations on the subject of the management of railways is disappointing in the extreme. The failure on the part of the Commission to deal with this question as also to deal effectively with the rates question, is inexplicable, as these matters were always understood to be within the purview of their work. A representative committee should now be appointed with as little delay as possible to examine the whole question. I am emphatically of opinion that all our railways in order to be thoroughly nationalised, should be entirely managed by the State. In the wise words of Mr. Churchill which Reuter transmitted to us over the wires the other day, 'the railways must henceforth be run in the general interest of the public as a whole and not in that of a class.' It will be readily conceded, I hope, that if nationalised railways are necessary for the industrial and agricultural development of an advanced country like England, they are all the more so for an industrially backward country like India. It is said, that a special officer has been appointed by the Railway Board to go into the whole question of rates; and that he has already written a volume containing his recommendations. If this is correct, it is due to the public that his report should be published at an early date. Meanwhile, I welcome the principles enunciated by the Commission in paras 272 and 275 on the subject of the adjustment of railway ratings in the interest of indigenous industries.

I also welcome as steps in the right direction, the recommendations of the Commission about the appointment of a commercial member of the Railway Board and about the presence at the railway conference and at meetings of the goods classification committees, of representatives of British and Indian commercial bodies. At the same time, I am sure it will be readily admitted that the country should legitimately expect and is entitled to insist upon the introduction of a much larger element of Indians in the higher grades of the railway service. I am aware of the system of appointing Indians as probationers in state-railways; but it would be interesting to know why even there, no appointments were made this year.

Considerable thought has very properly been devoted by the Commission to the question of technical and scientific education; industrial experiment; and to research. The overlapping and misdirecting of energy in the existing arrangements have been recognized and exposed; and valuable suggestions are made regarding their improvements. In view of the very valuable recommendations made in the

Report for the immediate establishment of provincial technological institutes, as also for the ultimate establishment of a central chemical institute, I am unable to agree with my friend Pandit Madan Mohan Malaviya in pressing for the immediate establishment of a central polytechnique institute in place of those recommended by the Commission, particularly because as recommended by Pandit Madan Mohan himself, the report of the Commission simultaneously recommends the utilization of existing facilities by the immediate development of the teaching of science and technology in our existing universities, and numerous collegiate institutes, and also because of a much larger and a more liberal annual provision recommended for scholarships for studies in foreign countries. In this connection, I would insist that the Indian Government when buying from English manufactories, such of their stores and other requirements as cannot be made in this country, must make it an absolute condition precedent to the orders, that Indians in certain numbers should be annually trained in their factories. Failing their acceptance of this condition, the Government should go past them and place the orders with foreign manufactories. I know that this suggestion was put forward by several witnesses before the Commissioners, but it is unfortunate in the extreme that they have for reasons best known to themselves, thought fit to ignore it. I submit that the Indian Government exists only for this country and that it is its first and paramount duty to safeguard the interests of India and not those of the British manufacturers. It is a notorious fact that British manufacturers have studiously and more persistently, so of late, refused to admit and train Indians in their factories. It is said that Japan makes a similar condition when placing orders for British goods with British manufacturers and that these conditions are invariably accepted. If a foreign country like Japan can enforce this condition, it is incomprehensible to me why the Indian Government which is a part of the British Empire cannot, unless it is assumed that it does not wish to.

In this connection, I would also insist that the Railways and Public Works workshops should provide adequate facilities for the training of Indians as suggested in the report; and that they should also be admitted to their higher grades.

The introduction of the scheme of trade commissioners for India and assistant Indian trade commissioners is good, and, I welcome it. But I would device means at an early date by which the trade-commissionerships should be held by qualified Indians. I would, at the same time, also urge the extension of the scheme to all the important countries of the world; and would also incidentally refer

to extremely low salaries of £500 for Indian assistant trade commissioners, for which, at best, only second-class men would be available. The report also deals with numerous minor suggestions in addition to those I have already spoken of. Into the details of these, we need not go.

The concrete and definite proposals both imperial and provincial, made in the report, to which I have already briefly referred, will mean, if accepted, by the Government, an initial cost of Rs. 2,16,00,000 inclusive of the three possible institutions and a current annual expenditure of Rs. 1,23,00,000. How far the elaborate machinery devised, and the enormous capital and current expenditure recommended for it, will supply the real needs of the country, is enveloped in the mist of the future. But one thing is quite clear to my mind, that the success of this entire scheme must very largely depend upon the extent of the power that it is given to the representatives of the people in the Legislative Council to promote and control the industrial development of India.

I wish, however, that great attention had been paid by the Commission to the formulation of an adequate organization for propelling industrial enterprises in the country on a scale commensurate with the magnitude of the movement, the scheme for the educative machinery for which has been recommended, as we have already seen, at such a tremendous outlay and with such great care and elaboration. Among the most important omissions, I would give the first place (a) to the question of the adumbration of a comprehensive system of financing the industries, such as industrial banks, which as we have seen, have been relegated to an expert committee and (b) to the question of tariffs.

POVERTY OF INDIA.

(a) It is a fact which cannot be denied that India is one of the poorest countries in the world and that her economic resources are of the scantiest character. The fabulous wealth of India which formed the topics of the historians of old, and attracted traders and plunderers alike to her unguarded and hospitable shores, is now, for all practical purposes, a thing of the past. Whether it be by her own folly or as the result of the heavy drain which necessarily accompanies a costly foreign Government, which unduly largely employs foreign agencies in every department of the Government and remits to England as much as the annual yield of the whole country from land, by way of home and other charges,—and that too from an almost entirely agricultural country like India; whether it be by some artificial or natural cause beyond the control of the Government and the people, or as the result of a policy of unequal and unrighteous

distribution of the burdens of state; the stern fact remains and cannot be gainsaid that even to-day, after 150 years of British rule, India—in spite of her enormous wealth of raw products—is the poorest country in the world with only an annual average income of £. 2 per head: and that her resources for Industrial and other developments, are therefore necessarily almost nil. The need for supplementing them by all possible means open to the Government and the people, is consequently proportionately greater and more urgent than any other. It is equally true that a great many industries that could be started with success and for which the raw materials and other facilities are near at hand, could not be started in this country for want of the requisite funds. This is not only true in the case of such gigantic industries as the production of steel, sugar, colour, dyes and oils, but also in the case of a great many minor industries such as the manufacture of glass, candle, soap, matches, etc. It is now a matter of common knowledge that in a large majority of cases in which industrial enterprises have collapsed, the main cause of the failure, is want of capital to begin with and in some cases, insufficient resources not only for current expenses but even for obtaining urgent expert advice and technical knowledge. That this should be so in a country which is not industrial to any very appreciable extent in the sense in which many of the great European countries are, and in which money under normal conditions ought not, therefore, to be difficult to find, is itself an important factor for very careful and serious consideration. The fact, however, is there, that it is so. Although I am prepared to admit that as a rule, capital in this country is shy, slow to move and unwilling to flow in untrodden paths, it cannot still be denied that it is difficult to raise money in India for industrial purposes, first, because the country is poor and there is not much capital in it; and secondly, because there are no efficient banking organizations which can mobilize the financial forces of the country and make capital easily accessible. When the industrial development of a country is dependent upon capital, acquired largely through the gathering of small sums, special industrial banks like those in Japan and Germany or similar organizations, should be established with large capitals and numerous branches, designed to afford financial support to industries for longer periods and on less, restricted security than is within the power or practice of existing banks. Such banks or organizations, must, of course, require a large measure of Government support, although they need not necessarily be brought under rigid Government control. I am emphatically of opinion that Government should

lend its whole-hearted support to such banks and place very large funds at their disposal, if possible, without interest; but in no case at a rate higher than 2 or 3 per cent. These banks should be included in the list of approved banks or financial concerns, in which trustees should be allowed to deposit Government funds. Remittances to these banks should be accepted by the district treasuries and the presidency banks; and they should be allowed to issue bonds for a limited period of not longer than ten years to the extent of at least double paid-up capitals. Fixed deposits for shorter periods than two years should not be received; and no current accounts should be opened in these banks, excepting for parties whom they finance.

GOLD STANDARD RESERVE.

I fail to see why the large reserves in India and those held in England on account of this country under various heads, cannot also be partly utilized for the industrial development of the country and placed at the disposal of such banks as I have described, if necessary, even under stringent Government control. There is the large gold standard reserve, amounting to over Rs. 50 crores. Then, there are the paper currency reserves which go considerably over this figure; and the large cash balances. We may assume that the last two may be required at any moment and cannot, therefore, safely be utilized for any other purpose. We may not even speak of the gold ordinarily held in India which had gone down from about £ 6 million to about £ 100,000 on the 1st April, 1917, but no part of which is now held in India. But I cannot understand why a substantial portion, say about Rs. 10 or Rs. 15 crores out of the 50 crores of the gold standard reserve, cannot be utilized for industrial purposes. I have seen and heard various objections urged against this and similar proposals, but am sorry to have to say that I have not yet heard of a single really convincing argument advanced against this suggestion. First of all this gold standard reserve has no business to be in England. One of the recommendations of the Fowler Committee laid down that *the gold standard reserve should be held in gold and in India*. This has not been done; and instead, about £ 5 to 6 millions are usually lent out to private borrowers in England at short notice; and the balance is invariably invested in Exchequer Bonds, Exchange Bills, and British and Colonial Government Securities. There is no cogent reason why this should be so; and I am of opinion that a substantial portion of it can certainly be made available for industrial purposes in this country, with reasonable safeguards. During the last 20 years, I believe there was occasion to draw upon this fund in England *only once* and that too to

a very small extent owing to the balance of trade going against India; and it is very unlikely that such occasions will come in the future with any degree of frequency.

FINANCIAL ASSISTANCE.

There are other methods both direct and indirect by which financial assistance *can be given* for industrial purposes and is being given in some countries of the world, such as, money grants-in-aid, bounties and subsidies, guaranteed dividends, supply of machinery and plant on the hire-purchase system, guaranteed or preferential Government purchase of products for limited periods and exemption from income tax, import duties and other cesses during the initial stages of newly-established and infant industries. Some of these are undoubtedly likely to be beneficial, and are even recommended in the report of the Commission; but, for various reasons I am against money grants-in-aid, bounties and subsidies, and guaranteed dividends except on very special grounds.

(b) There is some excuse, at least so far as the Commission is concerned, for the omission of the tariff-question, as it was deliberately removed from the scope of the enquiry. This step on the part of the Government has undoubtedly emasculated the enquiry, crippled the entire report and made it impossible for the commissioners to carry many of their recommendations to their natural and inevitable logical conclusions, as is evident from the dilemma in which they found themselves placed, as for instance, in the case of the leather industry—a circumstance which drew from them, the pathetic admission occurring at the beginning of para 54 at page 37 of the report, which runs as follows:—

'Here again, the exclusion of the question of tariffs from our terms of reference renders us unable to recommend any complete scheme for dealing with the situation.'

The resolution of Sir Ibrahim Rahimtoola of March 1916, asking for an inquiry into the industrial conditions of the country, made it quite clear that without fiscal freedom, the result would not be adequate. The hon. Sir William Clark accepted the resolution on behalf of Government but without the question of fiscal policy.

I cannot help saying that the Government in the past has not only neglected to develop the natural and other resources of the country but has also in a variety of ways, including huge protective tariff walls levied against Indian goods in England contrived to crush our nascent industries. The action of the East India Company with regard to Indian industries is sad reading and must form one of the blackest pages of British history. In recent years, the imposition of the excise duty on

the cloth made in India at the dictation of Lancashire and the more recent and artificial raising of the rate of exchange between England and India for wiping out the balance of trade in favour of India even as a special war measure, must also condemn England in the judgment of an impartial posterity.

EXCESS PROFITS.

The contemplated imposition of the new fangled excess profits bill is, in my opinion, also going to be a huge load upon the industries of the country. It is a wanton and deliberate breach of the undertaking to the contrary given by the Government of India in March, 1917. It gives the direct lie to the promise of an active industrial policy outlined in the Montagu-Chelmsford reform proposals and in the report of the Industrial Commission. It is wrong in principal unequal in its incidence, and is totally indefensible from an industrial point of view. It will seriously impede the expansion of existing industries and the initiation of new ones. It is almost a levy on capital and freely violates all the accepted canons of taxation. If the profits the country has made owing to the special condition created by the war were great so are the losses now resulting from the tremendous dislocation that has followed its sudden cessation. It stands to reason therefore that if the Government wishes to have its share of the one, it cannot possibly repudiate its responsibility in the other. We are asked to suggest alternative sources of taxation. I venture to think that the war having been waged for the benefit not only of this but also of future generations, its burden must be equitably distributed by a long-period loan and not be unfairly imposed upon the present generation alone: or, in the alternative, the money required should be found out of tariff arrangements, as for instance, by the imposition of import duties on various articles. The Government having already accepted the principle of imposing duties for revenue purposes, ought not to find it difficult to do so. In short, I am emphatically of opinion that the proposed measure is an exceedingly obnoxious and inequitable one, and that the country should stoutly resist its imposition.

FISCAL AUTONOMY.

We must also set our face against the proposal of what is called *Imperial and Allied Preference*, unless meanwhile India is given fiscal autonomy and full control over her tariffs. In our present helpless economic and industrial condition we cannot possibly afford to be charitable to others out of sentimental considerations. To a student of our trade returns it is painfully evident that at present India is almost entirely an exporter of raw materials and a heavy importer of nearly all her requirements of finished products. In a word, therefore, the

compulsory inclusion of India in any such scheme of preference will be tantamount to forcing India to sell her raw materials to the different parts of the Empire or her Allies, cheaper than she can sell them elsewhere; and compelling her to buy her entire requirements of finished products from England and her Colonies and allies, at rates higher than those prevalent elsewhere.

In order that such and similar iniquities may not again be perpetrated in the future in the name and under the excuse of Imperial exigencies and in order that we may be enabled to adjust our own tariffs to suit the peculiar requirements and conditions of our country, it is absolutely necessary that India should have complete fiscal autonomy. Nothing short of this will satisfy the people of this country; nothing less will enable her to become industrially independent and great; and India should not rest content unless and until she has got it. It is pure camouflage to urge that the possession by India of fiscal freedom and her unrestrained use of it to protect her infant industries, will clash with England's free-trade policy. I hope there is no one so foolish in India still existing as to take such an argument seriously at this stage of our history. If the colonies can remain in the Empire and still arrange their tariffs in their own advantage and for their own benefit even against England; if they can thus advance their own interest without damaging those of the Empire, I fail to see why India cannot; unless it is sought to be made out in so many words that India is to continue to be the Cindrella of the Empire for all times and that what other parts of the Empire can claim with justice and obtain as a matter of right, India cannot. It is no exaggeration to say that this country will not regard any settlement about her industries as satisfactory, unless this question is solved according to her wishes and her requirements.

BRITISH FREE TRADE.

Speaking of the policy of free-trade that is forced on this country by England, we must clearly realise that it means, in other words, protection for England. This was admitted by even so anti-Indian an Imperialist as Lord Curzon in one of his utterances. If we had fiscal freedom and were allowed to impose duties on imports to protect our industries, it would bring more money into the pockets of the manufacturers, which, when full, would enable them not only to develop their own industries but would also afford ways and means for exploiting the markets of the world. I fail to see why England should thus protect her industries at our expense by compelling us to keep our doors open to receive her goods duty free. Whilst even such highly advanced and scientific countries like Germany, America

and Japan were forced to take the aid of tariff in order to develop their resources, poor India is expected by the Government, and I am sorry to add, even some Indian faddists, to build up her industries with the help of science alone. It must be remembered that though in the building up of industries, science is a great and important factor, it is by no means everything. It is a patent fact that Germany tried free trade after the Franco-German War but had to abandon it in 1879. France also tried her hand at it but failed. England, after building up her nascent industries with huge protective walls extending over centuries and wiping our infant Indian Industries out of existence by imposing on them, among other measures, prohibitive import duties, in some cases equivalent even to 80 per cent is now maintaining her trade with India and forcing her goods into India, through indirect protection of this character.

EXPLOITATION OF INDIA.

While on this subject, I cannot resist the temptation of alluding to a reference that was made about two years ago in the Houses of Commons to free-trade by Mr. Bonar Law which is sure to be of interest and is certainly not without its significance. Mr. Bonar Law, in the course of a discussion, said that India knew very well that free-trade was not for India's benefit and that it was mere hypocrisy for Englishmen to say that it was for her benefit. Lord Crewe, the then Secretary of State for India, said in reply that it was very wrong of a person in the position of Mr. Bonar Law to say that free trade that England had imposed on India was for England's benefit; and that such sentiments ought not to have been expressed in England as they were sure to affect the feelings of the people of India. Mr. Bonar Law maintained that what he had said was perfectly true; but as far as England was concerned, he wanted India to be a free-trading country, as her markets were very precious for England; and added that he asked this of India in return for services rendered. The sum total of this discussion ladies and gentlemen, is that both sides want to exploit India. The aim is identical; the difference is only one of method. We are often told that England will never allow India to impose duties on her goods. England has always declared that she is a selfless Trustee and holds India for India's good. I am sure, I am echoing your sentiments when I say that she has no title to such a claim so long as she persists in maintaining, in this and similar other matters of equal importance, such an unreasonable and outrageous attitude, as I have endeavoured to describe.

CONCLUSION.

If the report of the Commission is remarkable for the boldness and originality of the recommendations it makes for the future, it is no less so for the many admissions it makes in numerous places of the defects of Government policy in industrial matters in the past. The measures now recommended, however, and similar other steps should have been taken more than half a century ago? and no Government with a full and adequate sense of its responsibility to the people over whom Providence has called it to rule, can be excused for neglecting these preliminary steps which are essential to the industrial development of any country. There is ample evidence of a very concrete and substantial character to enable us to come to the conclusion that on the whole the Government of India has not done its duty to this country in the past so far as its industrial needs are concerned.

With her vast natural resources, her inexhaustible supply of most raw materials, her abundant mineral wealth, her enormous population, her climatic conditions of every possible kind, there is little which India cannot achieve industrially; there is almost nothing which she cannot produce and manufacture. In industries at least, this country is fitted to give law to the world. Nature has dealt kindly and generously with her. It is only man that has neglected to do his duty by her. If India is to progress industrially, she should be left untrammelled and allowed to find out her own peculiar requirements, to have complete control over her finances, to adjust her tariffs; and in short to work out her destiny in the best way suited to her. I wonder if British statesmanship will rise to the full height of its stature and leave India free to develop the spirit, the genius and the soul of her people according to her wishes.

TOPICS FROM ECONOMIC PERIODICALS.

AGRICULTURAL EDUCATION.

The following address (taken from the *Tropical Agriculturist*) was given by the Director of Agriculture, Ceylon, to the Teachers of the Educational Conference on their visit to the Botanic Gardens and Experiment Station, Peradeniya, on Tuesday, August 20th, 1918:—

My address to Teachers assembled for the Teachers' Conference at Kandy will be brief as I wish to read an article prepared by Mr. DRIEBERG (unavoidably absent to-day), giving details concerning the actual progress that has been made during the past few years in that sphere where Agriculture and Education have been marching hand-in-hand in Ceylon, *viz.*, the School and Home Gardens attached to Primary Schools.

Before offering to you certain suggestions which should, I think, be accorded your careful consideration, I desire to accord to you on behalf of the Department of Agriculture a hearty welcome to the Royal Botanic Gardens and the Experiment Station at Peradeniya.

The Royal Botanic Gardens at Peradeniya date from 1821, and it is unnecessary for me to detail to you the various services that these gardens have rendered to the Colony of Ceylon, to its botany and its agriculture. The Experiment Station was opened in 1902 and has produced valuable data in connection with the cacao, rubber and tea industries.

It is not my intention to dwell upon these topics nor to go into a general discourse on agricultural education. Rather would I ask you to consider the education of the colony as it exists at present and whether you consider that it is fully designed to meet the requirements of the population.

The war has brought about in all parts of the Empire a recognition of the importance of education—more especially of technical education. It is obvious to all, that in the economic struggle that is bound to take place after the war, those countries which are not fitting themselves will be severely handicapped. This fact has been given more serious consideration in the Home Country and is receiving close examination in India. What technical educa-

tion is to the country dependent upon industries, agricultural education should be to the country that is dependent upon its agriculture. If there is need for greater effort towards technical education for industry—equally under certain conditions there is need for greater effort towards agricultural education for agriculture.

Over sixty per cent of our resident population in Ceylon is directly concerned with agriculture, but is the provision that is being made for the general education of the country towards a rural or agricultural bias sufficient for its needs?

In our Primary Schools, whether they be vernacular or anglo-vernacular, the subject of Nature Study is taught through School Gardens. There are 369 Government Primary Schools to which School Gardens are attached, and 77 Grant-in-aid Primary Schools. Nature Study is a subject of high educational value and although it must clearly be kept in view that agriculture cannot be taught in Primary Schools, only good can result in an agricultural country from acquainting the elder children with some of the principles that underlie the art of agriculture. Whereas the subject of Nature Study can be taught with relative ease in rural districts where the environment of the school is entirely agricultural, it is more difficult in our large towns and cities. But I would urge that for this reason it should not be overlooked. Rather more should greater stress be laid upon the subject, in order to interest the pupils to make observations on Nature and to appreciate country surroundings. The establishment of Home Gardens has recently been undertaken. This movement is becoming popular and is possible of important extension. It conforms with the experience of the U. S. A. in rural schools and the great success that has been obtained there indicates that similar successful results may be expected in Ceylon.

From the Primary Schools we pass to the Secondary Schools. Science is taught in these schools I am aware. In the Kindergartens nature study is an important branch of the work, botany is continued in some schools in the junior classes, but ultimately the bulk of the science taught consists of chemistry and physics. Why is it that the science subjects should be solely chemistry and physics? Is it because they may be considered as examination subjects in which good marks can be obtained? Rather would I see a lower standard in these subjects, and that they be considered in their application to agriculture. Similarly should elementary geology, botany, zoology and physiology as applied to agriculture find there place with chemistry and physics in the Science Classes of our Secondary Schools and Colleges. Examining bodies will provide examinations in subjects if they are asked to do so. The

Cambridge authorities already provide for an examination in Agricultural Science and several Crown Colonies have adopted agricultural courses in their Secondary Schools. It is a matter of satisfaction to me that one of the Colleges of Ceylon is contemplating the adoption of an agricultural science course, but I would go further and state that in an agricultural colony such as Ceylon—a country destined to remain for many years to come agricultural—every Secondary School should be devoting all its energies on the science side to the teaching of Agricultural Science.

From the Secondary Schools we pass to the School of Tropical Agriculture in whose main building you are now assembled. The students for this school are carefully selected and are given an essentially practical course. Similarly special courses are arranged for Headmen and for the training of Teachers. In the future it is my hope to see similar agricultural schools established in the Northern Province, and Southern Province the Western Province or North-Western Province, and the provision of a much higher course at Peradeniya possibly in connection with the Ceylon University or University College.

The life work of our people is agriculture, and in recent years a very important part of the work of our professional men has been agriculture.

Technical education is being provided for in the Technical Schools, but agricultural education is also technical education, and in addition to the teaching of agricultural science in the Secondary Schools, provision should be made for technical schools for agriculture. Education in the hands of the administrator is a means to an end. It may be utilized as in the past, to the training of character, individualism and love of freedom so dear to us all, or it may be utilized as suggested for the Home Country in fitting the people for the forthcoming industrial struggle. What is the position of Ceylon? Let us look fifty years ahead. To-day Ceylon is agricultural. What will it be fifty years hence? Even then its mainstay will be agriculture. But the Competition in the products of tropical agriculture will have become more severe. It is our duty therefore to use all our efforts towards improving our knowledge of and training in agriculture. If we do not, what may be expected of our educational efforts? Already we have examples of countries with people weaned from the land. May not our position be the same.

There is at present a welcome desire for more education. Let there be a desire for more education towards agriculture before it is too late.

Further education will lead to an understanding and appreciation of a better standard of living. What will be the result if the means of providing

for that better standard of living are not forthcoming? The improvement in agriculture must go hand-in-hand with the improvement in education. We are beginning, may I say, an educational awakening. Let us not close our eyes to the urgent necessity of directing our education along lines likely to be beneficial to our only industry of importance—Agriculture.

This education must not be confined to Nature Study in Primary Schools, and the more advanced course in technical agricultural subjects at the School of Tropical Agriculture. Throughout the whole of our schools attention should be given to agriculture and to the sciences that underlie its practices and principles.

THE SCHOOL GARDEN.

Mr. C. Driberg, Superintendent of School Gardens in Ceylon, writes in the *Tropical Agriculturist*.—

In an old book occurs the following passage: "As the use of of Gardens hath been the Inclination of Kings and the Choice of Philosophers, so it hath been the common Favourite of public and private men; a pleasure of the Greatest, and the Ease of the meanest; and, indeed, an Employment and a Possession, for which no man is too High or too Low."

That is pretty comprehensive summation of the value of the Garden, albeit quaintly put.

The original conception of a Garden is a place where one can rest—a spot dedicated to wholesome relaxation in which the worker could for a time forget his cares and renew his energies.

And this is the correct idea which should be associated with every Garden whether attached to the home or to the school. It is here that one should realize the truth of the oft-quoted lines.—

One is nearer God's heart in a Garden.

Than any where else on Earth.

If this is the true conception of the Garden should we hesitate to bring our little children into contact with it so that they may derive the solace, inspiration and power it can give them?

A recent contributor to the discussion on education referred to the out come of the work done in the generality of our schools as "arid erudition," and that I think pretty well describes it. What is wanting in our school boys, who so successfully pass examinations, is a lively interest in the world around them, and an intelligent appreciation of natural phenomena.

If there is anything that is calculated to supply this want it is the movement in favour of Nature Study and School Gardening. The two go together,

one being complementary to the other: and it is a mistake to try to disassociate them. Some people think that School Gardening is nothing more than a hobby: but that is not so.

A member of the Board of Education in England refers to the work in the School Garden as "a natural gymnastic, bridging over the space that separates physical and intellectual growth, and supplying a link between learning and life."

PROF. GEDDES has said: "Of all the facilities which teacher and school board can provide, and which central authority can encourage, let me plead for the School Garden," which he terms "the fulcrum for our nature study efforts."

In one of His Majesty's Inspectors reports occurs the following: "While the boys are at work in their Garden they learn to keep their eyes open to all that passes, and to be alive to every change in earth and air and soil, and in all life that depends on them for sustenance. These changes they do not merely observe and forget The great advantage of a garden for nature study is that the field of observation is simple and definite, two limitations to elementary studies which it is of the highest importance to bear in mind."

LORD AVEBERY pleads strenuously for the study of plants *in situ*, since he says, they lose half their interest when they are gathered.

The leaves of plants in themselves are a study, and Ruskin, in a beautiful passage, thus refers to their attractiveness: "They take all kinds of strange shapes, as if to invite us to examine them. Star shaped, heart shaped, spear shaped, arrow shaped, fretted, fringed, cleft, furrowed, serrated, sinuated, in whorls, in tufts, in spires, in wreaths, endlessly expressive, deceptive, fantastic, never the same from foot stalk to blossom, they seem perpetually to tempt our watchfulness and take delight in outstepping our wonder."

Twenty years ago the village schools in this colony were bare and uninviting structures, standing out bleak and menacing to the eyes of the little urchins who were unwillingly driven to them. Today the majority of them are set amidst beautiful surroundings—each a veritable pleasure—to which the children are instinctively drawn by an attraction they cannot resist.

The origin of the modern School Garden is said to be traceable to a continental monk who in the year 1695 recognized the educational value of the Garden attached to his orphanage.

In a recent contribution on rural education to the *Journal of the Department of Agriculture, Ireland*, the writer refers to a School Garden and its functions: In the school Garden, he says, which should be attached to or near the school, the pupils are taught

to grow and care for plants. Its size is of no consequence—it may be a quarter acre or more, it may be only a few square yards—it is the work done that matters. But the pupils not merely cultivate the Garden: they are taught to observe and to think,—to use their hands, eyes, and mind in conjunction—to think in realities not in symbols, since real objects and visible changes are brought before them.

The main objects of School Gardening may be thus summarized:—

1. To train the children to habits of observation and serve as a basis for Nature Study.
2. To brighten the surroundings of the School.
3. To relieve the routine of indoor work with outdoor work of a pleasant and recreative nature.
4. To instil order, neatness and good taste.
5. To cultivate a love of gardening.
6. To teach the dignity of labour and encourage an honest pride in the outcome of the work of one's hands.

Indirectly the School Garden also serves (1) as a training ground where the boys learn the cultivation of useful and ornamental plants, and lay the foundation of practical agriculture and gardening (2) as a means of disseminating seeds and plants (3) as an agency for the spread of information regarding new crops.

It was in 1900 that a definite policy for Ceylon regarding the establishing of School Gardens was decided upon.

In 1901 six Gardens were established: in 1902 there were thirty-six; 1903, fifty-five; 1904, Seventy-three; in 1905, a hundred and six; 1906, 132; 1907, 134; 1908, 180; 1909, 224; 1910-11, 246; 1911-12, 261; 1912-13, 329; 1913-14, 33; 1914-15, 343; 1915-16, 384; 1916-17, 403.

In 1912 School Gardening was made a subject for grant in grant-in-aid schools.

It will thus be seen that the movement has been growing fairly rapidly in the Island, and had a larger vote and more inspectors been available, the number to-day would be considerably greater.

For purposes of comparison the following figures will be of interest:—In England in 1902 there were 387 School Gardens: but in 1915 there were 3,100 garden schools out of a total of 19,000 elementary schools.

The number in Scotland for the year 1913-14 was 500; in Wales for the same period 213. In Ireland there were 70 School Gardens in 1912. Since when the number has increased to 126.

Originally there was but one inspector available to help the Superintendent; now there are 3. Additional assistants are urgently needed for the extension of the scheme.

The initial difficulties in establishing School Gardens were considerable. There were difficulties in securing suitable land and satisfactory water supply; while the objection of parents to the children doing manual labour was for time a serious obstacle. But by co-operation between the Agricultural and Education Departments, as well as the various revenue officers and the chief headmen, these difficulties and obstacle have gradually disappeared, while village folk have come to realize the value of the training which their children are receiving.

The attitude of teachers was at first not altogether favourable: chiefly owing to ignorance of the real object of the School Garden, and the way to set about the work; but to-day there is a very different state of affairs.

We have now a book of School Garden Regulation explaining very fully and clearly the aims and objects of the scheme, and providing useful hints to teachers and others interested in the working of School Gardens.

Elementary text books have also been adopted dealing mainly with plant life and the history and cultivation of common plants.

Further encouragement has been given to school children by the offer of prizes for Home Gardens, *i.e.*, Gardens established by the children themselves at their own homes. This extension movement is an appropriate corollary to the main scheme, and is calculated to bring its benefits home (in more than one sense) to the rural population.

Home Gardens should prove an important educative factor, giving, as they do, to the boys a sense of ownership and personal responsibility, encouraging in them the spirit of enterprise, and last but not least, making them realize the power (and pleasure) of production.

"Produce, Produce," says CARLYLE, "were it but the pitifullest infinitesimal fraction of a product, produce it in God's name!"

And yet how many there are who have gone through life without ever having made an honest effort to achieve something—just taking what comes to them: and all because their early training was defective. They had not the power to act much less to achieve and produce!

Another recent innovation has been the selection of Central School Gardens, where demonstrations in Nature Teaching and School Gardening are given, which the teachers and assistants from neighbouring schools attend. This is a move in the right direction, and is calculated to bring the school and the garden into closer touch with one another.

We are thus progressing, and I think bid fair to make the right use of the School Garden for the attainment of a great purpose, *viz.*, the acquisition of knowledge without sacrificing the power to act, thus following the sage advice of poet who wrote:—

"Let books and nature be their early joy,
And knowledge rightly honoured with that name,

Knowledge not purchased with the loss of power."

ECONOMIC NOTES.

INDUSTRIES AND COMMERCE

Profits of Bengal Jute Mills.

An estimate of the profits of the Bengal jute mills during the first half of 1918 has been made in the Department of statistics from a detailed analysis of the published accounts of 36 jute mill companies (including one sterling company registered in the United Kingdom) whose accounts were closed during the half year. It is interesting to note how sterling companies are being transformed into rupee companies.

From 1914 to 1916 there were 9 sterling companies (including one French company working at Chander-nagore); three of these were transformed in 1917 into rupee companies under the Indian Act. There are thus 6 sterling companies now working in Bengal, of which one is, as stated above, dealt with in the statistics for the first half of 1918. The other five companies which close their accounts in the second half of the year will be dealt with in the next statement, that is, for the latter half of 1918. The compilation of the data has been made uniform as far as practicable, and the 36 mills have been regarded as one mill. In all cases the profits have been shown after deduction of Indian income tax and super tax, because the amount of tax paid was not always shown separately in the Balance sheets but lumped with other items of expenditure under the head of "Manufacturing and other expenses." In the case of the sterling company the British income tax and the British excess profits duty have been deducted as well as the Indian income tax and super tax. The profits are shown before and after deduction of interest on debentures. Some companies have paid off their debentures, others are in the process of doing so, while others again have created debenture redemption funds out of surplus profits. Debenture interest is not shown separately in all the published accounts but the amounts have been ascertained as correctly as possible. No allowance has been made for depreciation as no uniform practice of writing off depreciation is followed by jute mills in Bengal. The results are summarised below as compared with the pre-war profits and the profits since the outbreak of war.

Profits of Bengal Jute Mill Companies.

Year				Number of Cos. whose accounts were closed during each half year	Profits before deduction of interest on debentures	Interest on debentures	Net profits (subjects to depreciation)	Ratio of net profits (Col. 5) to total paid up capital.
					Rs. (1000)	Rs. (1000)	Rs. (1000)	
1914	First half (pre-war) ...	...	...	31	6,490	994	5,496	10
	Second half	...	...	38	8,245	1,396	6,849	
1915	First half ...	...	...	31	17,045	10,07	16,038	58
	Second half...	...	...	38	55,260	1,374	53,886	
1916	First half ...	...	...	32	39,499	1,025	38,474	75
	Second half...	...	...	39	55,139	1,288	53,851	
1917	First half ...	...	...	34	26,678	959	25,719	49
	Second half...	...	...	40	40,035	1,174	38,861	
1918	First	...	...	36	72,800	950	71,850	73*

It will be seen from the above statement that the profits during the first half of 1918 have surpassed all previous records.

* This ratio has been calculated on the profits of only the first half of 1918.

INDIAN MINERAL PRODUCTION IN 1917.

The particulars below are taken from the Report of Dr. H. H. Hayden, C.I.E., F.R.S. Director, Geological Survey of India:—

Table below shows the values of the production of minerals for which returns are obtainable:—

Total value of Minerals for which returns of Production are available for the years 1916 and 1917.

Mineral	1916	1917	Increase	Decrease	Variation per cent
	£	£	£	£	
Coal	3,878,564	4,511,645	633,081	...	16'3
Gold	2,303,023	2,221,889	...	81,134	—3'5
Manganese-ore	1,487,026	1,501,080	14,054	...	'9
Petroleum	1,119,405	1,092,964	...	26,441	—2'4
Salt	728,358	983,157	224,799	...	34'9
Tungsten-ore	497,397	623,074	125,677	...	25'3
Saltpetre	607,488	527,666	...	79,822	—13'1
Lead and Lead-ore	428,383	510,539	82,156	...	19'1
Mica (a)	311,680	508,173	196,493	...	63
Building materials and road metal	209,334	249,776	40,442	...	19'3
Silver	88,687	237,216	148,529	...	167'5
Tin-ore and tin	39,302	66,533	27,231	...	69'3
Jadestone (a)	48,926	67,502	18,576	...	...
Monazite	37,714	56,489	18,775	...	50
Ruby, sapphire and spinel	37,513	51,831	14,318	...	38'2
Iron-ore	37,981	39,977	1,996	...	5'2
Copper-ore	3,259	30,162	26,903	...	825'5
Chromite	16,401	26,216	9,815	...	59'8
Magnesite	14,065	14,559	494	...	3'5
Clay	4,645	9,019	4,374	...	94'1
Steatite	2,628	6,470	3,842	...	146'2
Corundum	2,783	3,874	1,091	...	39'2
Alum	6,205	3,707	...	2,498	—40'3
Diamond	361	1,826	1,465	...	405'8
Ochre	941	1,630	689	...	73'2
Gypsum	745	1,034	289	...	38'8
Amber	157	684	527	...	335'7
Molybdenite	202	626	424	...	209'9
Bauxite	463	620	157	...	33'9
Graphite	1,501	542	...	954	—63'5
Asbestos ... ..	...	303	303	...	...
Agate	783	255	...	528	—67'5
Bismuth ... ..	...	163	163	...	...
Antimony-ore	503	139	...	364	—72'4
Platinum	46	19	...	27	—58'7
Total	11,916,469	13,351,364	1,626,663	191,768	12'4
			+1,434,895		

(a) Export values.

It will be seen that there has been an apparent increase of nearly £1½ million or 12½ per cent in the value of the total production over that of 1916. The value figures, however, are largely artificial. In some instances although the output has fallen in quantity, it has increased in value; such increase does not necessarily give a true indication of the state of an industry, since the prevailing high freight and increased cost of production have in certain cases resulted in the closing down of all but high-grade propositions.

MINERAL CONCESSIONS GRANTED.

The number of mineral concessions granted during the year amounted to 574 as against 532 in the preceding year; 515 of these were prospecting licenses and thirty nine mining leases. As in the preceding year, most of the increase is due to prospecting activity in Lower Burma.

CHROMITE.

The remarkable rate of increase in the production of chromite recorded in the preceding year was not maintained in 1917. There was, however, an increase of over 34 per cent in the output. This was due almost entirely to operations in Baluchistan, where the output was more than doubled. There was a slight increase in the Singhbhum production, and a decrease in Mysore.

COAL.

There was an increase of nearly a million tons or 5½ per cent and a proportionately greater increase in value—16·3 per cent—in the output of coal. The pit's mouth value increased largely everywhere, except in the case of Hyderabad. There was an increase of Rs. 9 per ton in pit's mouth value in the North-West Frontier Province, but as the output is less than 100 tons, the figures for that province may be left out of consideration. In the fields of Bengal, Bihar and Orissa, the rates of increase were respectively Re. 0-6-4 and Re. 0-6-0 per ton.

There was a fall of over 50 per cent in the amount of coal exported, and a small rise in imports. The total amount of coal, coke and patent fuel imported, however, was only 37,626 tons. The quantity exported was 408,117 tons against nearly 882,000 tons in 1916.

There was a general increase in the output of coal in most provinces, with the exception of Baluchistan Bengal, Central India the Rajputana. The decrease in Bengal amounted to nearly 361,000 tons; Bihar and Orissa, on the other hand, shows an increase of over a million tons, the Central Provinces nearly 84,000 tons, and Hyderabad over 65,000 tons. The decrease in the output of the Bikner coal-field in Rajputana amounted to more than 50 per cent as compared with the preceding year.

The average number of persons employed daily in the coal-fields increased by nearly 11,000 or rather less than 7 per cent. The average output per person employed was 108·88 tons as against 110·21 in the preceding year. The total number of fatal accidents was 172 or 1·02 per thousand persons employed.

COPPER.

There was a large increase in the output of copper ore in Singhbhum from 2,173 tons, valued at £30,259 in 1916 to 20,108 tons valued at £30,162 in the year under review. It is hoped that the smelting operations of the Cape Copper Co., will soon result in a considerable increase in output.

DIAMONDS.

The output of diamonds was again insignificant, being only 18·2 carats. The value (£1,827), however, shows a marked increase over that of the output of the preceding year.

GOLD.

There was a further decrease amounting to 24,000 oz. in the output of gold. As in the preceding year, this was due chiefly to fall in the Kolar production. There was also a fall of over 5,000 oz. in the Hyderabad fields and of nearly 2,000 oz. in Madras. The output in Singhbhum increased from 864 oz. to 2,462 oz.

GRAPHITE.

There was a considerable reduction in the production of graphite in Kalahandi, where the output fell from 252 tons, valued at £168, in 1916 to 60·4 tons, valued at £242, in the year under review, while in Rajputana there was a still greater fall from 1,066·4 to 423 tons valued at £305.

IRON.

There was a small rise in the output of iron-ore. The Tata Iron and Steel Company produced 167,870 tons of pig iron and 114,027 tons of steel including steel rails, while the Bengal Iron and Steel Company produced 80,262 tons of pig and 2,256 tons of cast-iron castings. In the Central Provinces there was a slight increase in the number of indigenous furnaces at work, 312 being operated during the year; at the same time there was a fall in production.

JADEITE.

There was a slight increase in the output of jadeite produced in Burma from 3,783·37 cwt. in 1916 to 3,961·28 cwt. in the year under review. There was a very marked increase in the value from £9,315 to £28,931. This increase is attributed to a preponderance in the output of the high-grade qualities used for jewellery and other ornamental purposes.

LEAD.

There was a very large increase in the output of ore from the Bawdwin mines, which rose from

about 15,000 tons in 1916 to over 71,000 tons in the year under review. There was not, however, a commensurate increase in the amount of lead extracted which was only 16,962 tons, as against 13,790 tons in the preceding year. There was an increase of over 100 per cent, however, in the quantity of silver extracted, which amounted to 1,580, 557 oz. in the 1917 as against 759,012 oz. in the preceding year.

MAGNESITE.

There was a further slight increase in the production of magnesite, which rose from 17,640 tons in 1916, to 18,202 tons, valued at £14,559, in the year under review.

MANGANESE.

There was a slight fall in the production of manganese, but at the same time the value of the output was higher than that of the preceding year. This, of course, is due to the artificial conditions prevailing at present.

MICA.

As in the case of manganese, there was an apparent fall in the amount of mica produced, but a rise in the value of the output, the total production in 1917 being returned as 40,907·6 cwt. valued at £141,605. The amount exported, on the other hand, was 62,434 cwt. or over 50 per cent. more than the quantity reported as produced in the country. This cannot be due entirely to stocks held from previous years, and as has been pointed out before, indicates imperfect returns. Owing to the recent heavy demand for mica and to the higher prices offered, there was increased activity in mining during the past year, and there is very little doubt that the output figures are too low. There is a thriving trade in mica theft in some of the mining areas, and stolen mica naturally does not appear in the output returns.

MONAZITE.

The production of monazite in Travancore rose from 1,292·48 tons valued at £37,714 in 1916 to 1,940·3 tons valued at £56,489 in 1917.

PETROLEUM.

There was a decrease of over 14 million gallons in the output of petroleum in Burma and India, the total production being 282,759,523 gallons. The production of the Yenangyaung Oil-field fell from nearly 199 million gallons in 1916 to 176,979,020 gallons in the year under review. The yield of the Singu Oilfield was 85,639,166 gallons, approximately the same as in the preceding year. There were slight increases in the outputs of the Yenangyat and Minbu fields, but a falling off in Kyaukpyu. In Assam the output of the Digboi Field increased by over 1 million gallons, or nearly 23 per cent, while

the new Badarpur field in Assam produced nearly 3 million gallons. In the Punjab, the Attock Oil-field increased its production more than three-fold, the output having risen from a little over 112,000 gallons to 618,528 gallons in 1917.

The imports of kerosene oil decreased largely in 1917, being only a little over 33 million gallons as compared with nearly 60 million gallons in the preceding year. 438,888 cwt. of paraffin wax, valued at £669,479, were exported.

PLATINUM.

The output of platinum fell to almost nothing, being only 3·79 oz.; this was obtained, as usual, during the dredging operations of the Burma Gold Dredging Company at Myitkyina.

RUBY, SAPPHIRE AND SPINEL.

There was a slight decrease in the output of the Ruby Mines during the year under review. The estimated value of the output, however, rose to £51,831.

SALT.

There was a slight decrease in the amount, and a slight rise in the value, of the output of salt in 1917 as compared with that of the preceding year. There was also a slight decline in the amount imported, from 446,069 tons, valued at £1,260,295 in 1916, to 341,986 tons valued at £1,360,093 in the year under review.

SALTPETRE.

The production of saltpetre fell from over 25,000 tons in 1916 to 21,283·8 tons valued at £527,666 in 1917. Most of the reduction occurred in the United Provinces. There was an increase in the quantity exported, which amounted to 515,374 cwt., valued at £677,856, in 1917 as against 485,000 cwt. in the preceding year.

SILVER.

Practically the whole of the silver production comes from the Badwin lead-zinc mines, which, as already stated (see *Lead*), produced 1,580,557 oz. in the year under review. The Anantapur gold mine in Madras also produced 1,281 oz.

TIN.

There was a considerable increase—amounting to 43 per cent—in the amount of tin-ore produced. This all came from Burma, which yielded 13,326 cwt. valued at £65,533. 2,817·9 cwt. of block tin were also produced in Mergui district as the result of local smelting operations. The imports of black tin amounted to 28,180 cwt., valued at £292,135.

N.B.—The tin-ore of the Southern Shan States is produced in the form of mixed cassiterite-wolfram concentrates; the output is therefore returned in

terms of the mixed concentrate, the approximate composition of which is usually 43 per cent wolfram to 57 per cent cassiterite. The total figure for 1917 is 14,239 cwt.; for the purposes of this *Review* it has been assumed that 8,088 cwt. of this represent tin-ore and the remainder wolfram.

TUNGSTEN.

The production of wolfram rose by nearly 22 per cent, from a little under 3,700 tons in 1916 to over 4,500 tons in the year under review. The Central Provinces have now ceased to produce, and there has only been a small increase in the output in Singhbhum. The output of the Degana mines in Rajputana has increased somewhat but is still insignificant, the absence of water being a serious handicap to efficient treatment of the material. Over 80 per cent of the total output of wolfram came from Tavoy, where the industry has shown highly satisfactory progress, the production having increased by nearly 75 per cent during the last two years.

WAR TRADE OF JAPAN.

Prosperity of Commerce and Industry.

During the four years of war it has been inevitable that the economic market of Japan should have been greatly affected both directly and in consequence of the economic dislocation in Europe and America. A brief review of the leading features of Japan's foreign trade, taken from a statement issued by the Department of Finance, is therefore of great interest, says the *Board of Trade Journal*.

THE PRE-WAR PERIOD.

At the time preceding the outbreak of the War, Japan had been suffering from the effect of the extraordinary reaction that followed the boom in all spheres of activity after the close of the Russo-Japanese War. The trade and industries were then depressed, the balance of trade continued adverse, and the supply of money was always short. Both the Government and people had to follow a negative and retiring policy in financial and economic affairs. All ideas of launching new undertakings were repressed as much as possible, the flotation of new foreign loans was discontinued, the primary motive actuating them being how to give relief to the straitened condition of national finance and to lighten the burdens of the people.

OUTBREAK OF THE WAR.

When the War broke out in July, 1914, and Japan entered it on the Allied side, sending an expedition to capture Tsingtao, the effect exerted on her economic market was on the whole unfavourable. The agitation that had come over the money market in Europe adversely affected that of Japan, and her bankers were persuaded to adopt the policy of contraction. Then the increased peril at sea, with abnormal rise of insurance rates and the disturbance of foreign exchanges, combined to retard the movement of foreign trade. The slump of the staple export, raw silk, was a hard blow.

Fortunately the influence of all unfavourable factors on the market was not so serious, chiefly owing to the fact that Japan is remote from the theatre of war, and also to the restrictive financial policy pursued for many years before by the Government. It was not long before a favourable turn set in for her market.

FINANCIAL YEAR, 1915-16.

The economic market that was temporarily hit by the War was followed in 1915-16 by an unprecedented activity brought about by various causes. In the first place, the arrival of large orders for munitions from the Allies, and similar orders from the Eastern countries and the South Seas, where the far imports from Germany and other belligerents had ceased to come, enlivened the export trade. In the second place, the scarcity of freight space throughout the world, and the abnormal rise of charterage of Japanese ships engaged in foreign trade, brought in its train a phenomenal activity in shipbuilding. Again, the sudden shortage of imported chemico-industrial productions, and of machines and machinery, and the abnormal advance of their quotation, stimulated the launching of enterprises in those lines at home. Lastly, the marked accumulation of funds owing to the combined result of the first two factors facilitated the expansion of trade and industries.

SITUATION IN 1917.

Though in the early part of the year the general economic tendency continued brisk the enlargement of the sphere of the War soon began to work adversely against the export trade both from external and internal causes, the former from the restriction placed on the consumption of various articles and the ban enforced on both imports and exports. Then in Japan, as counter measures actuated by those special arrangements abroad, shipment of a number of articles was prohibited while the money market, currency, prices and freight market were placed under control. In the latter half of 1917 the economic market entered a new era a predominant note of

which was one of restraint in various directions, quite a striking contrast compared with the two preceding years. It was fortunate that the accumulated funds that accrued from the previous period of prosperity saved the market from sustaining any heavy blow, and enabled it to pass the year on the whole satisfactorily.

FOREIGN TRADE,

During the period from August, 1914, to the end of 1917 Japan's exports totalled Yen 3,798,000,000 (£389,019,769), against imports amounting to Yen 2,623,000,000 (£268,667,418), leaving balance of Yen 1,175,000,000 (£120,352,351) in favour of exports.

This is a striking contrast compared with the period prior to 1913 inclusive, when the total volume of trade rarely reached the level of Yen 700,000,000 (£71,699,273), while as to balance of trade it was only in a single year that the Customs returns recorded excess of exports over imports during the ten years indicated, the balance being the other way for the other nine years.

This enormous shipment to foreign markets was due, classified by kind of commodities, to large orders for grain, cotton goods, raw silk, copper, steamships and miscellaneous goods—orders being specially heavy from America, India, China and the South Seas.

The thriving foreign trade, coupled with similar activity in the shipping business, yielded a large credit for Japan in her international account, this credit amounting to Yen 751,000,000 (£76,923,077), of which Yen 328,000,000 (£33,596,231) was brought home.

DEVELOPMENT OF DOMESTIC INDUSTRIES.

The prosperity of foreign trade and the non-arrival of certain class of imports supplied a strong encouragement to the rise of industrial enterprises. Of agriculture, it is sufficient to say that its productions, favoured by seasonable weather continued to record a steady increase; but it was in the two spheres of industrial activity, manufacture and mining, that a notable progress was noticed, especially in the former, due to sudden rise of manifold industries in which chemical, mineral, textile, smelting and shipbuilding industries were most conspicuous. The activity in mining enterprise was most marked in increased output, the total value in 1917 being doubled compared with 1914. Among the productions, silver, copper, coal, iron and sulphur contributed most to the total.

The total amount of investment in the creation of the new and the expansion of old undertakings reached Yen 2,200,000,000 (£225,340,572), the greater part of which went to manufacturing industries and mining.

MONEY MARKET.

The sudden appearance of sundry enterprises, and the issue of a small amount of Government securities, did not particularly affect the money market; on the contrary, it remained easy in consequence of a large inflow of money from abroad.

Thus the total volume of banking deposits rose from Yen 2,000,000,000 (£204,855,065) at the time of the outbreak of the War to Yen 4,800,000,000 (£491,652,156) as existing at the end of 1917. The rate of interest fell throughout the country. In Tokio the ruling rate that stood at first at 8.3 per cent. a year fell to 5.9 at the end of 1915, to rise slightly afterwards, that is, 6.2 per cent. or thereabouts at which level the market has long remained stationary.

Another sign of the times was a marked rise of the average quotation of stocks; what did not exceed Yen 48 at first stood at Yen 104 at the end of 1917. This state of affairs was also reflected on the market price of commodities, it rising about 70 per cent. in 1917. The volume of currency swelled high, and the Bank of Japan's convertible notes in circulation rose at the end of 1917 to the record figure of Yen 830,000,000 (£85,014,852), as against Yen 330,000,000 (£33,808,086) at the end of July, 1914.

FINANCIAL SUPPORT TO THE ALLIES.

The favourable development on the whole of Japan's economic market has relieved the country on the one hand from the financial pressure that was weighing upon it in consequence of the Russo-Japan War, and on the other apparently has paved the way for her industrial and trade expansion in future. When it is remembered that the progress was mainly due to causes suddenly coming from without, there is greater need for solidifying its foundation internally.

Japan's endeavours to promote the common cause of the Allies is not confined to operations on land and sea. The extension of financial support to them, so far as circumstances admitted, also claimed earnest attention on her part. In this respect Japan generally followed the plan of devoting the money obtained from abroad since the War to contribute to the support of the Allies, either by subscribing for the loans issued by them or by purchasing their bonds.

The total amount invested in all those securities reached at the end of 1917 Yen 1,1159,000,000 (£118,713,510), consisting of Yen 530,000,000 (£54,286,592) in British Government bonds Yen 254,000,000 (£26,016,593) in Russian Government bonds, and Yen 155,000,000 (£15,876,268) in French Government bonds, to which is to be added Yen 220,000,000 (£22,534,057), representing Japanese foreign loan bonds and company debentures redeemed in foreign market.

In short Japan devoted nearly the whole of her favourable trade balance from the beginning of the War to extending financial support to the Allies.

FINANCIAL AND ECONOMIC CONDITIONS COMPARED WITH THOSE BEFORE THE WAR.

	At the end of July, 1918.	At the end of July, 1914.	Increase (+) Decrease (-)
	Yen.	Yen.	Per Cent.
Amount of National—			
* Debts outstanding	*2,529,655,353	2,530,162,513	0
Coins in Circulation	208,597,967	179,118,470	+ 16.5
Bank of Japan—			
Note issued	770,219,218	331,035,390	+ 122.7
Specie Reserve	645,076,810	216,503,420	+ 198.0
Tokio Associated Banks—			
Capitals paid up	202,853,138	143,305,525	+ 41.6
Deposits	1,663,420,716	439,100,360	+ 278.8
Loans and Discounts	1,407,012,302	490,108,937	+ 187.0
Osaka Associated Banks—			
Capitals paid up	94,564,935	50,287,625	x 88.0
Deposits	1,081,043,714	233,319,450	+ 363.3
Loans and Discounts	991,607,451	319,910,506	+ 210.0
Deposits in the Post Office Savings Bank	491,670,000	201,687,725	+ 143.8
	One year ending 31st July, 1918.	One year ending 31st July, 1914.	
Government Railway—			
Gross Earnings	187,633,022	110,511,876	+ 69.8
Foreign Trade—			
Value of Commodities exported	1,793,568,077	663,465,643	+ 170.3
Value of Commodities imported	1,483,986,923	696,485,258	+ 113.1
Total	3,277,555,000	1,359,950,901	... 141.0
Excess of Exports	309,581,154	—	—
Excess of Imports	—	33,019,615	—
Amount of Bills cleared in the Clearing Houses throughout the country	42,670,739,448	10,725,252,142	... 217.9
	For July, 1918.	For July, 1914.	
Average Price of Securities (in Tokio)	109.116	47.965	... 127.5
Average Index Number of Prices of Commodities (in Tokio)	25.627	12.575	... 103.8

* Excluding the amount of certain Special Exchequer Notes.

LAND FOR PUBLIC USE.

Proposed New Methods of Valuation.

The Ministry of Reconstruction have now issued, says the *Board of Trade Journal*, the Second Report of the Committee upon the Acquisition and Valuation of Land for Public Purposes, of which Mr. Leslie Scott, K.C., M.P., is Chairman. Their First Report, which was issued last January, recommended measures for cheapening, shortening and simplifying procedure for obtaining compulsory powers for the acqui-

sition of land, a procedure so cumbersome as to involve a delay of many months, and costs if anything from £500 upwards. In their Second Report the Committee devote attention to a suitable system for the valuation of land compulsorily acquired for public purposes.

PRESENT LEGAL POSITION.

The existing legal provision for dealing with such valuation is based upon the Lands Clauses Acts, the chief of which dates back to 1845. The experience of two generations has shown, the Report states, that this Act and the Amending Acts require re-consideration in order to give effect to the requirements of the community of to-day. The Lands

Clauses Acts are out of date, and should be replaced by a fresh Code.

NEW CRITERION OF VALUE TO OWNER.

Sums paid for property taken for public purposes have for many years past been frequently excessive. For this result it is impossible to assign any one cause, and the Committee deal in detail with several. Their main recommendation is that the basis of "value to the owner," which has hitherto been adopted as the criterion for such valuation under various judicial decisions (though no such criterion was, in fact, specifically laid down by the Lands Clauses Acts of 1845) should be replaced by a general standard of value to be paid to the owner, which is defined as "the market value as between a willing buyer and a willing seller." In addition to this value the owner would be entitled, under the Committee's proposals, to payment for consequential injury or any actual loss to him involved in the taking away of his land.

The Committee do not think that the fact of his land being acquired under compulsory powers for the public benefit should entitle an owner to additional compensation on that ground alone. They urge therefore that the conventional allowances for compulsory purchase (which in England and Wales is normally 10 per cent, and which in the case of agricultural land in Scotland has, in practice, resulted in giving 45 years' purchase of the gross annual value, representing in recent years nearly 100 per cent allowance) should be discontinued.

There are certain other corollaries following from the adoption of this standard of "market value" which are important, and for which special provision is made in the Report. On the vexed question of what is known as "special adaptability," the Committee recommend that an owner should not be entitled to any increased value for his land which arises solely from the adaptability of the land in question for a purpose to which it could be applied only under statutory powers. The adoption of this principle would put an end to the payment of excessive values for land required for reservoir sites, railways and other undertakings of a public nature which can only be initiated if statutory powers are granted by Parliament for the purpose. The high valuations which have handicapped such improvements in the past have been based largely upon hypothetical competition between different promoters requiring the land for the same purpose. Only one of these promoters could, in fact, have obtained the necessary statutory powers: the competition, therefore, upon which such values are based is imaginary.

The Committee further recommend that no enlargement of market value shall be taken into

account which arises from the use of the land in a manner contrary to sanitary or other laws and regulations (as illustrated in the provisions of the Housing of the Working Classes Acts, 1890, in regard to premises in an unhealthy area, where such premises are overcrowded, insanitary or unfit for human habitation.)

NOTICE TO TREAT.

The Committee made various recommendations with a view to giving promoters greater freedom in acquiring and disposing of properties required for their undertaking. They shall not be compelled to purchase any interest in land which is not required for the purpose of their undertaking, and they shall be able to specify in the "notice to treat" the date on which such notice is to take effect in regard to any interests which they do require. They shall have power to take part only of a property whenever they think fit, and to acquire rights of access or other easements over or under land whenever such rights or easements will, of themselves, be sufficient for the purpose of their undertaking. They shall further be entitled (on payment of all proper costs and compensation) to withdraw their "notice to treat" within two months of the delivery of the claim (which should cleanly set forth all items in respect of which compensation is demanded) or within such other date as may be directed. Finally, the promoters shall be entitled to use land free from any existing restrictions on its use (subject to payment of compensation to any persons actually damaged by the breach of such restrictions) and able, subject only to certain limitations in very special cases to hold and dispose of surplus lands not required for the purpose of their undertaking.

ASSESSMENT OF COMPENSATION.

An important question to which the Committee devote special attention is that of the constitution of the Tribunal for assessing compensation. They are unanimous in recommending that assessment by juries and by Justices of the Peace and stipendiary magistrates under the existing Acts should be abolished, and that the system under which two arbitrators and an umpire are appointed to adjudicate in such cases should be discontinued. Parties should, of course, be left free to appoint a single arbitrator on their own account if they agree upon the arbitrator to be selected; but if they do not so agree, the Committee recommend that the Tribunal should consist of a single arbitrator appointed by the Sanctioning Authority (the establishment of which was recommended in the first Report) from a panel consisting of eminent surveyors and other experts. At the same times, they provide that surveyors appointed to this panel, if they continue in private practice, should give an undertaking that so long as

they remain on the panel they will not give evidence in disputed cases on behalf either party. It is hoped that by this provision it will be possible to obtain the services of eminent and practical surveyors upon the panel from which arbitrators are to be selected, but that the anomaly will be avoided of having the same men appearing alternatively as judges and as advocates from day to day in the same class of case.

While the Committee think that a single arbitrator so selected will usually constitute the most suitable form of Tribunal for assessment of compensation, they provide that if either party desires it, the Sanctioning Authority shall have discretion to order a larger and special Tribunal. They further recommend that the Sanctioning Authority shall be empowered to make rules as to the procedure to be observed by the Assessment Tribunal, but that the Assessment Tribunal, in order to possess powers of penalising obstructive action, shall have absolute discretion over costs. Taxation returns in the possession of the Inland Revenue Valuation Department should be produced on request by the Assessment Tribunal. Appeals should be allowed to the High Court of Justice on any disputed question of law.

"BETTERMENT."

Another vexed question is that of what is known as "Betterment." The Committee think that the general principle of "betterment" and "corsement" (for which latter term in their Report they substitute the term "injurious affection" in a larger sense than that in which it is normally recognised under existing law) should generally be correlative. They attach much importance to an extended application of the principle of "betterment" on the ground that if persons whose property has been enhanced in value by public improvements are made to contribute to the cost of such improvements by means of a "betterment charge," there will be more inducement for promoters to undertake schemes (likely to develop the resources of the nation and the amenities of national life) which are in danger of being hampered or indefinitely postponed for financial reasons under the conditions likely to obtain after the war. In normal cases the Committee limit the percentage of such enhanced value which is to be contributed by the owner to 50 per cent.

Where the State is the promoter, the State should retain the whole of the "betterment charge." Where a local authority is the promoter, the Sanctioning Authority should decide whether the whole of the "betterment charge" should be retained by that authority or whether some proportion should be paid to the State. In the case of a private promoter, his share in the "betterment charge" should be

limited to the actual cost of construction of the works involved in his undertaking.

One of the main difficulties encountered in the past in applying the principle of "betterment" in a way which can practically assist the promotion of valuable public undertakings has been the heavy weight of costs involved in procuring the two sets of valuations of the land in its original condition, and of the same land after its enhancement by the public works in question. For this purpose the Committee recommend an extended utilisation of machinery already in existence in the Inland Revenue Valuation Department.

"INJURIOUS AFFECTION."

As to compensation for "injurious affection," the Committee recommended that its operations should be confined to (a) damage arising directly from the taking of the land, such as severance or disturbance of occupation in respect of which compensation should be paid in the general course; and (b) damage arising directly from the construction or use of the works in question, as to which damage the Sanctioning Authority should exercise discretion in determining whether compensation should be allowed or not, according to the circumstances of the case.

"RECOUPMENT."

The committee are not generally in favour of a system of what is known as "recoupment" i.e., the giving of powers to take land beyond what is necessary for the authorised works, in order to secure the enhanced value created by such works. They think that any general application of such a principle might have undesirable results in a tendency to speculation in land by public authorities, and that the general purpose of securing to the public some proportion of the enhanced value of land arising from enterprises of a public nature would be better served by the imposition of a "betterment charge" under the conditions which they recommended. But they think that acquisition of land for purposes of "recoupment" should be permitted in the case of State improvements, or where the land is required for the reinstatement of displaced interests or for the efficient development in the future of a specific undertaking.

They conclude by saying that a simple, quick and economical system for the acquisition of land is essential alike to the development of the nation's resources and to sound progress, and that a new code established by legislation to replace that embodied in the Land Clauses Acts should involve a more complete acceptance of the principle of expropriation in the public interest than that which has prevailed in the past.

INDUSTRIES AND COMMERCE.

Investigation of Vegetable Dye-Stuffs in Japan.

The British Consul at Shimonoseki writes to the *Board of Trade Journal* :—

Considerable attention has been devoted of late to the exploitation of the resources of the woods and fields in Japan with a view to the increase in production of vegetable dye-stuffs (owing to the present scarcity of chemical dyes), and recent research in this direction has met with success.

The Department of Agriculture and Commerce has caused investigations to be conducted throughout the country through the experts attached to the Prefectural Governments and to the various agricultural associations and the Forestry Bureau.

Some sixty varieties of trees and twelve varieties of plants have been found to have value as raw material for dyes. The director of the Forestry Bureau of Okayama has enumerated some of these as follows :—

Penus Densiflora (Japanese: Aka-matsu).—This tree is found throughout Japan in a wild state. A dark brown dye is extracted from the leaves, which are used for cotton yarn.

Pinus Thunbergu (Japanese: Kuro-matsu).—This common variety of pine gives a dark dye. A certain factory in Kagawa Prefecture extracts this dye as follows:—10 parts of fresh leaves are added to 3·3 parts sulphur and 10 parts sulphite of soda, and the mixture is heated with water for five hours. The resulting dye commands a ready sale.

Chestnut (Japanese: Kuri).—Also a common tree. Treatment of the bark with sulphide of copper gives a dye for saddlery wares. The leaves and bark also yield a black which is used for dyeing silk haori (outer garments). The root gives a yellow dye used in staining furniture and similar work.

Quereus Dentata (Japaneses: Kashiwa).—This tree is found generally in Japan. From a decoction of the bark a dye material is obtained, which is used for dyeing hemp, cotton, etc., khaki colour.

Quercus Serrata (Japanese: Kunugi).—The leaves are collected in September and fermented. The fermented leaves are boiled and yield both brown and deep green dyes.

Pomegranate (Japanese: Zakuro).—The bark of this tree gives a leather dye.

Pasania Cuspidata (Japanese: Shii).—A dye is made from this tree for fishing nets.

Camellia Japonica (Japanese: Tsubaki).—The leaves when pressed fresh yield a green which is used for dyeing cheap mosquito nets.

A tree called in Japanese "Motekoku."—This tree gives from the leaves a light brown dye.

Myrica Rubra (Japanese: Yamaromo).—The juice extracted from the leaves and bark gives a dye for fishing nets, also a priming for indigo dyeing, and is used for dyeing khaki uniform cloth.

Eleurites Cordata (Japanese Abura-giri). *Quercus Gilve* (Ichii). *Pagoda-tree* (Enju). *Juglans Sieboldii* (Onigurumi). *Raphiolepis Japonica* (Sharimbai), and several other trees yield dye material from their leaves, bark or roots.

Of plants from which dyes may be extracted may be mentioned the *Swertia Chinensis* (Senburi), *Lespedeza Pilosa* (Neko-hagi), and *Coptis* (Oren).

THE CHLORATE OF POTASH INDUSTRY.

Following the outbreak of the War the manufacture of chlorate of potash in Japan underwent a great development, but depression has resulted owing to over-production, high freights, and the disinclination of steamship companies to ship the chemical, owing to its dangerous character.

This industry is not of long standing in Japan, for, according to the *Japan Chronicle*, it was only in 1908 that the Nippon Kagaku Kogyo Kaisha began the tentative manufacture of chlorate of potash. This was the first undertaking of the kind in the country. It was not until 1912 that any considerable quantity of the article began to appear on the market.

During the war the suspension or reduction of imports sent up prices, and as a result a number of new producers made their appearance. The industry continued active up to last year, but the inevitable result occurred—over-production. This naturally led to a decline in prices, and the industry has since become depressed. The trade now depends chiefly upon exports to the United States and South America.

NUMBER OF FACTORIES ENGAGED.

According to investigations made by the Department of Agriculture and Commerce, at the end of 1917 there were 49 factories engaged in the manufacture of chlorate of potash. Their total capacity amounted to 10,000 tons a year, but the actual

output totalled only 6,000 tons, while the capital invested in the industry amounted to 6,000,000 yen.

About 60 per cent of the total output is represented by that of the Nippon Lagaku Kagaku Kogyo Kaisha, Nippon Denka Kogyo Kaisha, and the Kyushu Kido Kaisha, the other producers operating on a small scale. According to capacity, the 49 factories may be classified as follows :—

Monthly production.		Factories.
Over 1,000 barrels ...	...	3
Over 300 barrels - ...	...	7
Over 100 barrels ...	...	15
Under 100 barrels ...	...	24
Total ...	...	49

DOMESTIC CONSUMPTION.

The increase in the domestic demand is much less than that in output. No definite figures regarding domestic consumption are available, but there is reason to believe that before the war it amounted to about 3,700 tons.

The following figures represent the imports in recent years mentioned, the quantity being in kin (1 kin=about 1½ lb.) :—1907, 6,133,758 kin; 1908, 4,431,868 kin; 1909, 7,458,958 kin; 1910, 6,092,342 kin; 1911, 6,326,937 kin; 1912, 6,654,317 kin; average, 6,182,000 kin. The average of 6,182,000 kin works out at about 3,700 tons; and, since there was practically no output in this country at the time, this figure may be taken as showing the domestic consumption before the war.

PROSPECTS.

It seems that the trade has now passed its height of prosperity, but prices are still high as compared with the pre-war quotations. In October about 50 yen per barrel was quoted, compared with 15 or 16 yen before the war.

As to the future prospects, considerable doubt is expressed whether Japanese producers will be able to successfully compete with their British and German rivals. As a remedy it is urged that small-scale producers should combine, so as to increase their power of resistance against foreign competitors.

BOARD OF INDUSTRIAL RESEARCH.

For Mysore State.

The following Order, No. 4550-0—I. & C. 171-16-8, dated 28th November 1918, has been issued by the Government of Mysore :—

With a view to ensure continuous attention being paid to the development of Chemical, and other allied, industries in the State by systematic investigations into the possibilities of the economic utilisation of the natural resources of the State, Government have decided to establish a Committee composed of select Scientific and other Technical experts available in the State.

2. The Committee will be designated the 'Board for Chemical and Industrial Research and Scientific Advice' and will, to begin with, be constituted as follows :—

Chairman.—

Mr. P. Raghavendra Rao, Extra Member of Council.

Members.—

The Director of Industries and Commerce.

The Director of Mines and Geology.

The Director of Agriculture.

The Director of Public Health Institute.

The Chief Electrical Engineer.

The Professor of Physics, Central College.

The Professor of Organic Chemistry, Central College.

The Professor of Chemistry, Central College.

Secretary.—

Mr. S. G. Shastry, Industrial Chemist.

3. A working Committee consisting of five members will be appointed to attend to the actual work of investigation, distribution of work among the works and supervision over students under training, collection and publication of results. The Advisory Committee will meet once every quarter, or, as often as may be necessary; while the working Committee shall meet, at least, once every month.

4. The Board will be requested to send up to Government detailed proposals in regard to its functions, methods of work, etc. Approval of Government may be obtained, in the first instance, to such tentative proposals as are considered necessary to commence work pending formulation of more comprehensive proposals.

5. One of the first duties, however, of the Board will be to select, at once, a dozen subjects of immediate practical interest and to entrust the work of

investigation to young men having the necessary capacity and aptitude.

6. For the present, the following laboratories will be utilised, as far as possible, for carrying on the work of the Board :—

1. Agricultural Department Laboratory.
2. Public Health Institute „
3. Central College Physics and Chemical Laboratories.

5. The Industries and Commerce Laboratory.

N.B.—If, and when, circumstances necessitate it, recourse may be had to, and help obtained from, the Laboratories of the Indian Institute of Science.

7. The Board is requested to proceed to distribute at once the work proposed to be undertaken among the several workers.

8. The Board may, after an experience of twelve months' working on the above lines, submit to Government detailed proposals regarding (i)—co-ordinating and standardising the work of the several agencies employed on Research work, (ii) improving the organisation as a whole, and (iii) further outlay considered necessary on laboratories, etc., for developing the work.

9. Government are pleased to direct that a sum of Rs. 10,000 be placed at the disposal of the Chairman of the Board for the current year to be utilised, in the best manner possible, in giving effect to the provisional scheme as indicated above. The amount will be met by reappropriation from the lump sum provision for Development in the Industries and Commerce Department Budget.

10. Government direct that steps be taken to begin work from the 1st January 1919 and a report of progress made submitted to them once every quarter.

EDUCATION IN THE UNITED PROVINCES.

Addressing the Annual convocation of the University of Allahabad on Saturday the 25th January last, Sir Harcourt Butler the Chancellor of the University made an interesting speech. The following are extracts from it:—

Mr. Vice-Chancellor and Gentlemen,—I ask you to stand whild on behalf of the University I express our humble loyal sympathy with their Royal and Imperial Majesties and the Royal Family in their sorrowful bereavement I will convey our feeling to his Excellency the Viceroy and ask him to transmit it home.

I deem it a signal honour to preside at the Convocation of the University. When I first came to Allahabad in 1890, the University was just three years old. I remember the thoughtful inaugural address of Sir Alfred Lyall who gave us our motto, shaped our constitution, and realized a great measure of what he called 'autonomy in education' or 'provincial self-government in the sphere of education.' I promise you that I will do all I can to serve our University while I am Chancellor.

My first duty is to thank our late Vice-Chancellor, Dr. Sir Pramoda Charan Banarji, for the ability, tact and dignity with which he has presided over the deliberations and executive action of the University. I know that he undertook this heavy responsibility out of sheer public spirit. In welcoming Mr. Justice Piggott I need only say that we all admire his ability, enthusiasm and eloquence and his active sympathy with the rising generation.

The degrees which I have just has the honour to confer on Dr. Banerji and Dr. Ward are a fitting recognition of their high services to the study of law and of science. Dr. Ward is a veteran in education and commands the confidence of officials and non-officials, alike for his great abilities no less than for his sterling independence and devotion to his calling.

LOSSES OF THE UNIVERSITY.

During the last year the University has sustained grievous loss in the death of five great men, my tried and close personal friends, Dr. Hill, Dr. Sir Sunder Lal, Dr. Venis, Professor Homersham Cox and Professor Gardiner Brown.

They all gave of their best to the University and their best was very good. Dr. Hill was a chemist of rare distinction and a principal and professor of high character and influence. Recent progress in science teaching is largely due to his initiative and example. I have paid more than one tribute to Sir Sunder Lal and to his long, honourable and beneficent connection with this University. He was the first non-official Indian to be Vice-Chancellor of any Indian University. It is, I feel, one of the meritorious acts of my official life that I suggested his name to my old chief, the then Chancellor, Sir James La Touche. Dr. Venis was principal of the Government Sanskrit College at Benares for thirty years and for 17 years also he was principal of the Queen's College. He was one of the oldest members of the University, a fine scholar with a highly critical and cultivated mind, steeped in philosophy. No European has ever perhaps attained such knowledge of the traditional learning of Sanskrit. He was both a pupil and teacher of Pandits, living in close intimacy with renowned Pandits of the old school. An eminent Russian scholar once told me

that Dr. Venis had forgotten more than any savant in Europe had learnt. He will be remembered as a teacher rather than as a scholar, because he has left little printed work behind him. But he did more than any man of his generation to preserve and promote Sanskrit learning. Professor Homersham Cox was not only a mathematician of very exceptional capacity and enthusiasm, but also brought an incisive mind to bear on all questions affecting this University. Professor Gardiner Brown did more than any of his time for advancing the study of history.

Nor must I omit mention of those who left their class rooms and laboratories at the call of the Empire and gave their lives in its great service.

WHAT EDUCATION HAD DONE.

Looking back over 28½ years, I see vast strides in the education of this Province. One great change is the extension of the hostel system which has done much already and assuredly will do more as an agency for forming character. If we compare India of today with European countries at a corresponding stage of development, we need not be ashamed of our achievements. England did not get facilities for compulsory education until 1870 and it took six years, until 1876, before education was made generally compulsory. For several years after that the teachers in elementary schools in England were largely illiterates. Secondary education in England is still unsatisfactory, although there has been great improvement in the last few years. True, our own educational ideals in India are still far from clear. Our educational machinery is in part worn out and rusty. But still it has accomplished much. Faulty and makeshift as it necessarily has been our education has made modern India. It has purified the public services; it has increased the number of men who think; it has prepared the way for new ideas and larger conceptions of civic duty; it has opened new avenues of employment; it will end, I trust, in the growth and the spread of impertal ideas. There are still great walls of ignorance to be battered down. There are many and great temples of education to be built up. There is a call for the highest service from the best of India's sons. But the embers have been sirred. The beginnings of a desire for free and compulsory education are manifest. Great hopes thrive and grow. In a short time we have fulfilled a long time. Sir Alfred Lyall and truly in his inaugural address: 'Whatever else may be said of the English administration of India, no one can assert that in the matter of education the English have not been open-handed and unreservedly, almost and audaciously, liberal.' We have tried to give education to India on the basis of trust and common aspiration.

HUMANITIES AND SCIENCES.

No country is satisfied with its educational system. All are trying to improve it. We in this province, the Government and the people, are striving shoulder to shoulder to better things. It is mainly a question of finance, in other words, of material progress. For education and material progress go hand in hand. As education improves, so material prosperity advances; and with the advance of material prosperity funds become available to make education more efficient. The United States of America with a population one-third of that of India spend 160 million pounds sterling annually upon education. In India we cannot yet anticipate such an expenditure; but every sacrifice made for the cause of education will bear fruit a hundred fold in the years to come. Never forget that education breeds prosperity and prosperity breeds education.

None appreciates more than I do the value of a liberal education for its own sake. But we have to face things as they are. Every educational system rests on certain social order. The social order has changed and with this there must be a change of educational system. Even before the war new ideals of educational policy were in the air; and the war has changed the aspect of policy much as a stream of lava changes this country at the base of some great volcano, or a tidal wave changes some island in the Pacific Ocean. The war has broken up the despotism of the humanities and has installed a federation of the sciences and humanities. This is the great, the master change. For centuries education has, to use Macaulay's phrase, disdained to be useful. It must be useful now. And yet one may hope that the humanizing of science, the scientific use of the humanities will go on side by side. No mere materialistic education will ever satisfy India. Over and above us all towers the peak of sheer educational power, over us all is still cast the spell of the ideal.

Some of you will remember how Sir Auckland Colvin preached the importance of science to this University, and how his arguments were then regarded as an insidious undermining of political aspiration. I have seen one of our public men attacking Government in those days for its designs on humanistic studies and of late attacking Government for its neglect of science in education. I welcome the change of view. I will do my best to help you to meet the new demand, to promote 'research and discovery and the application of knowledge for the improvement of mankind.'

In England the epoch-making report of Sir J. J. Thomson's committee has pealed the bells of a new era. On every side one hears the cry for more and more applied science. The day of the specialist has

dawned at last. Chemistry, as Sir Thomas Holland aptly said, is the foundation of all modern civilized activities. India's great need to-day is the application of chemistry to agriculture and industry.

REFORM OF UNIVERSITIES.

The question of university reform will soon come upon us. The policy of the Government of India has been to restrict the area under which the affiliating universities have control by securing, in the first instance, a separate university for each of the leading provinces of India, and secondly, to create new local teaching and residential universities in each of the provinces in harmony with the best modern opinions as to the right road to educational efficiency. We have already a new university in the province, the Benares Hindu University. It is not a provincial institution, but it serves a larger number of our people. Considerable funds have been collected for a Muslim University at Alighrah. May I, as an old friend of Alighrah, who had the honour of knowing Sir Saiyad Ahmed Khan and was an intimate friend of Mr. Justice Mahmud, Nawab Mohsin-ul-Mulk, Nawab Viqar-ul-Mulk and others, appeal to my Muslim friends, who have done so well under trying conditions during the war, to close up ranks and work together for their sons and companions' sake in order that they may play their proper part in the educational development of the provinces. I contemplate the creation of new universities at Lucknow and later on at Agra. I shall appoint a committee to consider the establishment of these new universities as soon as the report of Dr. Sadler's committee is published. Great distinction must be drawn between the conditions that prevail in Calcutta and the conditions that prevail here, but I hope that we shall learn much from the report of that committee. We must also try to develop a teaching university in Allahabad. This will involve the separation of what may be called the internal and external branches of the university. There are reasons that Dr. Sadler's committee will make important proposals in this connection. It has long been my own view that all work above the standard of Bachelorship in arts and science should be university work concentrated at the university centre and directed entirely by the university. It was an objection to this view that it would lower the standard of collegiate study and so lead eventually to a lowering of the college professorial staff. This argument will be met in the future by increasing the number of local teaching universities. The province lends itself extraordinarily well geographically to a rearrangement of this kind. In any case the view advocated resembles the line of advance in the West. Sir J. J. Thomson's committee is clear on the point. In

America distinction is already drawn between the disciplinary education of the college and free-ranging education of the university. This, according to one American authority, is 'the most characteristic fact in the history of higher education during the past quarter of a century.' 'The college,' he continued, 'has for its object the important work of training students for the duties of citizenship, not primarily the duties of scholarship.' Another eminent American authority has outlined his idea of a university. The success of the higher work, he says, depends upon the intellectual and moral qualities of the professors, their freedom from all pecuniary anxiety, the widest publicity for their work and that of their assistants and students, and the steady improvement of libraries and laboratories.

A CHAIR OF GEOGRAPHY.

Under such a system pure research as distinct from applied research will be concentrated in the university. If we are to redeem our inferiority in the eyes of the educational world we must start research in every department to knowledge. 'Science,' said Sir Thomas Holland the other day, 'is not the monopoly of Europe, but we must do more than transplant the results, if it is to grow in India. We must undertake our own research work here.' Chairs of research have already been founded in this University in history and economics and the work done has been most satisfactory. But the scope is pitifully small. The whole prestige of Indian university education suffers from its relative barrenness in the matter of research. Outside the universities research has been pushed forward, at the Tata Institute Pusa and other agricultural college, Dehra Dun and elsewhere. In the region of medical and sanitary science the work of Leonard Rogers, Liston and many others has been second to none in the world. The annual reports of the Board of Scientific Advice in India, the agricultural, geological and forest journals, journal of Indian medical research and other scientific journals afford encouraging reading. But the universities have not led the way. We must multiply chairs. We must appeal to those who are wealthy to endow them. I entirely agree with all that Sir Leonard Rogers said on this subject the other day. My Government will be ready to help you in this vital matter. I make you one advance offer this afternoon. We are singularly deficient in the teaching of geography. Geography is now one of the great sciences. 'The forms of the land,' said Sir Achibald Geikie, 'and their origin, the climates of the globe, the distribution of plants and animals and the causes that have regulated it, the influence of the variations of climate, soil and topography upon the history of man, the reaction of man upon nature:—these and a thousand other connected problems form

the subject of the highest kind of geography. Such a theme invested with so much human interest possesses a peculiar value in education.' To which we may add its essential and transcendent value for the industrial advance of India, and her political incorporation in the British Empire. I am prepared to finance a chair of geography if you will secure from Europe a really trained geographer to inaugurate this new and fruitful course of study. Germany, France and Italy recognize the importance of this subject. In Italy alone there are twelve chairs of geography.

The science of geography is one of the main subjects of any course of commercial education. Except in the Universities of London and Birmingham, commercial education has not secured much support in England. But it has gone far in America and on the continent of Europe, and it must play a large part in the reconstruction of the world that we trust will follow the declaration of peace. In this University we have faculty of commerce which is capable of development. I do not say that this is present one of the most urgent and needed reforms of education in India. But if good results are to follow the recommendations of the Industrial Commission the importance of commercial education will soon be felt throughout India. In this connection let me quote to you the opinion of Professor Karl Pearson who devoted much attention to this branch of education: 'What is needed from the national stand-point is at most two or three perfectly efficient, fully manned, and fully equipped commercial universities attracting students from the whole area of the Empire. It is not a mere professor of commerce that is required, but ultimately a staff of ten or a dozen such professors, with a large auxiliary force of lecturers and assistants..... 'A fundamental rule of the commercial university ought to be the "third free year" of the Russian academic system, and this means that only two thirds of the senior staff will at any given time be actually engaged in teaching. The "third free year" is only free from teaching work, the lecturer is expected to travel for the purposes of research. Especially, owing to the rapidly altering, ever contracting and developing, processes of commerce will it be needful for the teacher to keep in touch with current progress and method. Nor can a man rear men to be pioneers unless he has done pioneering work himself.'

We must now enquire whether our libraries are sufficiently up to date and our laboratories sufficiently equipped for purposes of research. You will be interested to learn that we have asked the Government of India for a scientist capable of organizing the technological institute at Cawnpore for which the province has been waiting so long.

Our Senate has introduced a rule that speeches should be limited to ten minutes. Admirable rule, an example to all, disregarded by me, alas! this afternoon. My excuse is the magnitude and the difficulties of my theme. If I urge strongly the claims of scientific and practical education, it is because the times require them. Many minds must meet upon this problem before we can hammer out a scheme. Only three things I beg of you, first, let us, as far as possible, keep racial feeling out of education. Secondly, let us not be afraid of change and new ideas. Thirdly, let us face the future with big hopes and large schemes. It is not a time for timed compromise, or halting advance. A new world is in the making, which some of us will scarcely live to enjoy. You of the younger generation, who have received your degrees this, I hope, will live to see the great transformation. On your efforts the future of your country will depend. Cultivate enthusiasm. Go out into every corner of the province as missionaries of education. It is the highest service that you can render to your generation. The struggle may be long and arduous but the reward will be great. For you will bring prosperity and health, well-being and all the blessing to millions of your own people that material and moral progress carries in its train.

AGRICULTURE.

Mysore Amrut Mahal Department.

The following is an extract from the Mysore Government review on the Report of the Amrut Mahal Department for 1917-1918:—

Notwithstanding the scarcity of pasture and the breaking out of epizootic diseases such as Black-quarter and Rinderpest, the total mortality among the Amrut Mahal cattle was only 791 as against 885 in the previous year.

The percentage of birth-rate for the year was 40.51 as against 41.24 in the previous year; and that of the death-rate fell from 10.75 in 1916-17 to 9.26 in the year under review. The fall in the birth-rate is attributed to unseasonable rainfall, its unequal distribution and the want of pasture in summer. As observed by the Chief Commandant, the birth-rate might be improved by the supply of good breeding bulls to the several herds. This requires early attention.

With a view to improve pasture the Superintendent proposes to grow (1) Rhodes grass, (2) Guinea grass, (3) Elephant grass and (4) Mauritius water grass, in

selected localities. The result of the experiment will be awaited with interest.

The demand for the year amounted Rs. 57,907-2-7 as against Rs. 41,221-1-8 in the previous year, while the expenditure fell from Rs. 35,049-8-6 in 1916-17 to Rs. 26,853-8-6 during 1917-18, the decrease being mainly due to the savings effected in the pay of the Superintendent, Amrut Mahal Department,

One ram of the Australian flock is reported to have been given to a raiyat for breeding purposes and the number at the close of the year was 217. It is satisfactory to note that the Bangalore Woollen, Cotton and Silk Mills Company to whom samples of fleece were sent have pronounced them to be of good quality and to be free from kemp.

AGRICULTURE IN MADRAS

We take the following extracts from the Report on the Administration of the Madras Presidency for the year 1917-18:—

AGRICULTURE.

A season, favourable so far as the total quantity of rainfall went, was considerably marred by unequal distributions in the monsoons: breaks occurred at abnormal periods, and the usual break between the monsoons was practically, and in some districts entirely, unmarked. In spite of these seasonal disadvantages, however, the Agricultural Department were able to carry through their programme of experimental work almost unhindered, and the advance made in this sphere of activity is striking not less in kind than in degree. The measures recently undertaken in Egypt have been imitated in India, and the gratifying result has been attained that, in the Tinnevely district, the main cotton growing area of the Presidency, *Pulichai* cotton has been almost entirely eradicated, and the substitution of pure improved strains for the country mixture has been accomplished. The experimental work on paddy cultivation has assumed a definite shape and it is believed that the value of the Presidency crop can in time, as a result of these most important investigations, be increased by 20 per cent, or by no less a sum than twelve crores. Scientific work on the cocoanut has been inaugurated and a start has been made with apiculture. The projected scheme under which, in certain areas, the agricultural and co-operative credit departments will work in joint harness should produce a beneficial effect.

A shortage of labour impeded the activities of the Horticultural branch, but the experimental work

carried out on medicinal plants is in itself of considerable value. On the other hand, one of the most prominent and satisfactory features of the period under review is the record year—in every sense—of the Government Cinchona Factory at Niduvattam, which supplied no less than 20,000 lb. of quinine for the armies in East Africa and Mesopotamia and worked during the year at a profit of Rs. 7½ lakhs, or nearly double the annual expenditure.

FORESTS.

The policy of abandoning small isolated reserves and converting all valuable reserved lands into reserved forest was continued and some progress, though not a great deal, was made with the forest panchayat system. In common with all other departments the Forest Department suffered serious dislocation from the absence of its officer on military duty: in addition to this war services of the department were considerable. The marketing of tanning stuffs was handed over to the Munitions Board and the department was thereby involved in a loss of revenue approximating to Rs. 300,000 which may be regarded as a portion of the Presidency's financial contribution to the war. Tanning barks and hay as well as timber were supplied to the Military Departments in considerable quantity and the financial results of the year exhibited a notable profit.

TRADE.

The total value of the sea-borne trade of the presidency, which approached five thousand lakhs, showed a decrease, as against last year's figures, of five hundred lakhs; Government transactions were, however, very high on account of the purchase of tanned hides for the War Office. The general effect of the war was, as might be expected, to increase the British Empire's share in the Presidency's trade. The export statistics for the Presidency port show the highest figure for fourteen years, the principal increases being in ores, groundnut, oilcake, and vegetable oils. There was, of course, a corresponding decrease in imports, the commodities involved being such as the stoppage of shipping facilities from Europe would most naturally affect. Abnormal quantities, however, of sugar, rice, raw hides and mineral oils entered the country. The depletion of steam tonnage and the various export and import restrictions were a more serious blow to the small ports than ever, but led to an interesting revival in wooden ship-building for the coasting trade, which was increasing in volume towards the close of the year. In the absence of connexion with Europe, the exploitation of the Straits Settlements and Australian markets was markedly successful.

As regards internal trade, there were constant

complaints over the unavoidable shortage of rolling-stock and raw products formerly exported to Europe were seriously held up. The feature of the year—a feature with effects of a far-reaching nature—was the upward leap in the price of cotton, in sympathy with the rise in America. Rice rose steadily in price throughout the year, and though actual producers and middlemen secured almost universal profits, there was considerable pressure on persons with fixed incomes. The improvement in registration noticed in the previous year was not maintained.

INDUSTRIES.

Spinning and weaving concerns were fully employed throughout the year—principally in meeting the orders of the Military authorities; the tanning and leather industries similarly enjoyed a period of exceptional prosperity, and the coir industries of the West Coast, at first adversely affected, recovered owing to the placing of large orders for coir screening for camouflage purposes in France. Rice factories, however,—specially in the northern districts—were hard hit by the shortage of rolling-stock and many were forced to close down. Factory sanitation made a marked advance, but with factories working intermittently or not at all there was no regular demand for factory labour, and factory wages as compared with those outside, ruled low. In such a year the Department of Industries had of necessity numerous obstacles with which to contend; the shortage of rolling-stock, the scarcity of tannage of all classes, the anxiety as to the supply of coal, and most of all the increasing extent of Government control, all made against the progress of industrial enterprise. The Government Pencil Factory and the Government Soap Works increased their outturn and profits to a considerable degree; but the energies of the department were naturally devoted mainly to war effort and war production, and in such a year the development of indigenous industries other than those of military utility was unavoidably somewhat shelved. A second exhibition of Indian arts and industries, opened by His Excellency the Viceroy in December at Madras, attracted a very large number of exhibits, brought in a notable contribution to the War Fund, and, as emphasized in His Excellency's opening speech, vindicated by its existence the policy of industrial development pursued patiently, though without encouragement, by this Government for a couple of decades.

CO-OPERATIVE SOCIETIES.

The outstanding features of the year's working were the activities shown by agricultural societies and unions in the way of joint purchase and sale the opening of new societies more especially among the weavers and fishermen, and the expansion and development of supervision by local unions. No great

headway was made with the attempt to convert the Provincial Bank into a genuine federation, but its progress was otherwise satisfactory. New central Banks were registered and made a satisfactory start upon their careers. The improvement in collection by agricultural societies previously noticed was maintained during the year, but the arrears still remain heavy. A movement was made to bring the Co-operative Credit Department more closely into touch with the Department of Industries and to define the functions of these two departments and the lines along which their joint efforts might most profitably be directed. It is gratifying to record that the attitude of the general public was cordial and helpful throughout.

EDUCATION.

The System of Education in Australia.

At a recent Meeting of the Madras Teachers' Guild with Mr. Arthur Davies, M.A., Bar-at-Law, in the chair, the Rev. A. Jeffery, M.A., delivered an interesting and instructive lecture on 'The system of Education in Australia.' During the course of the lecture, Mr. Jeffery said:—There were three grades in the Educational System of Australia—Primary, Secondary and University. Primary education was free and compulsory. Children, both male and female, were sent to school when they were $4\frac{1}{2}$ years old and all children were compelled to attend school between their sixth and fourteenth years. A large number of Inspectors were appointed to enforce the matter; parents were heavily fined for not sending children to school. All schools were built by the Government, every child being provided with a school within three miles of its residence. In some parts where the population was sparse, there were half-time schools. Generally each school had its own masters or mistresses—all teachers being trained by the Government. In the Primary School, a boy was prepared for life and nature study was particularly attended to. On the model of the Japanese system, there were higher Elementary Schools started to fill up the gap between the highest class in the Primary School and the first grade of Secondary Schools. Some pupils went to Secondary Schools merely for an extra course. The majority of pupils attending Government Secondary Schools prepared themselves later for the teaching profession. In country centres there were Agricultural High Schools training pupils for agricultural work; and in them were taught biology, geology and such other sciences, pupils being taught the best

methods of ploughing, rearing cattle, etc. The counterpart of agricultural schools in city centres was technical schools that were located in big buildings. Carpentry, engineering and other sorts of industrial work were taught in these technical schools. In addition to Government Secondary Schools there were privately-owned schools, which had to subject themselves to Government inspection and control. In Victoria there were six public schools—all privately-owned and established on a religious foundation. These public schools were practically equivalent to the public schools of England; there was cultivated in them an *esprit de corps* which could not be found in Government schools. Every pupil in a public school was forced to take part in some out-door game and the manly qualities were consequently developed. The University was largely independent of the Government and could not be dictated to by the Government regarding the appointments of professors. The executive body of the University was the University Council consisting of 23 members—3 from the professional staff, 3 from the Parliament, and the rest elected by the graduates. There was also the Professorial Board which consisted of all professors and lecturers to advise the Council regarding questions about teaching and to attend to the discipline of students. The University system in Australia was different from that at Madras; the Australian University was a teaching body, while the Madras university was largely an examining body. The University Colleges were residential and contained big lecture-halls, museums and laboratories. The University was a huge compound containing all the University buildings.

At the end of the Secondary School course, a student knew what career he had to take up. Medical students were trained in Hospitals also, law students were trained in Law Courts in the fourth year, Science schools had their own laboratories for practical work, Engineering schools had scope for practical work and veterinary schools had places set apart for the treatment of cattle. The University had a large number of students' societies relating to history, law, medicine, etc.; there was more talk in the law society than in all the other societies put together. The executive of the Students' Representative Council had a voice in the meetings of the Professorial Board. In the Residential Colleges there were a number of tutors for the different faculties to give extra help and extra instruction. There was a Government scheme of scholarships and exhibitions by the aid of which deserving students were able to obtain their education almost free right through to the end of their University course. Public schools and certain colleges offered scholarships of their own.

Along with institutions for general education there was the Working Men's College, in which young men engaged in active business might receive education in the evening for a small fee; there was also the School of Domestic Economy for girls. There were Agricultural Colleges in addition to Agricultural Schools. Mining was taught in mining towns. Business Colleges had been opened for business training; but the fees were extraordinarily high. As regards examinations there was an attempt to introduce a new system by which each Principal should give his own certificate and the University should accept it in place of the Matriculation examination. It was not good to dispense with the Practical examination completely in medicine and scientific subjects.

At the end of the lecture, the Chairman suggested that the lecturer might answer any questions put to him on the subject. During the course of the answers, the lecturer said:—Specialisation as it existed at Madras, was unknown in Australia. In Agricultural and Technical Schools pupils had to pay along with ordinary fees special fees for practical work. In private schools the fees were considerably high. A Government scholarship covered only the ordinary fees of a student. The fees in the University varied according to the subject taken up. The salary of a Professor ranged from £800 a year up to £1,500 a year. A student entering the University must be at least 16 years old. In State schools boys as well as girls were admitted and there was practically an equal number of them. As for private schools there were separate boys' schools and girls' schools. In the History and Law societies in the University, there were violent debates about political questions; but the Professors could not take part in politics. There was no representative for the University in the Parliament. Religious or moral instruction was not and could not be given in Government schools.

In his concluding speech the Chairman said that religious education in Australia and the question why *esprit de corps* was not found in Government schools, might form the subject-matter for other lectures. The Madras University was modelled on the London University. The Australian University was only a glorified college calling itself a University; it was one unit. In Oxford each college had its own unity; there was rivalry among the different colleges; and the University as a whole was different from the colleges: the University life consisted in the competition among the different colleges. The Madras University had been attempting to make itself more than an examining body. Our model for the Madras University should be the Oxford University rather than the Australian.

BANKING.

Mysore Bank's Progress.

Presiding at the sixth ordinary General Meeting of the shareholders of the Bank of Mysore, Ltd., Bangalore, on February 5th, Rajasabhabhushana Diwan Bahadur K. P. Puttanna Chetty, C.I.E., reviewed the Bank's progress during the past five years in an interesting speech. The following are extracts from it:—

Once again I have the pleasure to welcome you to this, our sixth Annual General Meeting, and I am sure I will only be giving expression to the thoughts uppermost in all our minds when I state that we assemble to-day in circumstances very different from those we have gone through for the past four years, and all are full of thankfulness that the most terrible war that has scourged mankind has been brought to so successful a termination, by the defeat of our barbarous enemies and the complete vindication of the principles of justice and freedom for which our Empire and our gallant Allies drew the sword. Our gratitude wholeheartedly goes out to the Empire's brave men who gave, and those who have risked, their lives and secured for us this triumphant issue. You would also, I am sure, like me to express our sympathy with the relations of those who went forth from this State and have made the supreme sacrifice on the field of battle. Their noble example will be enshrined in our hearts, for they have set us an ideal of true devotion and patriotism to our country.

SIR M. VISVESVARAYA, K.C.I.E.

Before I deal with business matters on behalf of the bank, I would like to tender to Sir M. Visvesvaraya, K.C.I.E., our most sincere and grateful thanks for the constant sympathy and practical assistance he has at all times readily given us. To his foresight and keen perception of the wants of the people, coupled with H. H. the Maharaja's solicitude for the welfare and property of the State, do we owe the establishment of this Bank, and, if anything has cheered and kept alive his intense energies for the development of the Industries of this State, it has been the splendid success which this first venture of his Government has met with. We propose in due course to adorn the walls of our proposed new building with a life-size painting of Sir M. Visvesvaraya, and I am certain you will all heartily support the proposal. You will, no doubt, also like me to tender our congratulations to Rajaseva Dhurina

Sirdar M. Kantaraja Urs, C.S.I., on his appointment to the Dewanship of the State. I am sure that we will continue to receive from him and Mr. A. R. Banerji, C.I.E. the officiating Dewan, the same sympathy and assistance which we have hitherto received.

STRONG FINANCIAL POSITION OF BANK.

Turning now to the business immediately before us, it is a great pleasure to me and to my colleagues to lay before you the accounts for the half-year ended 1918, which, I think, will satisfy the most exacting of the shareholders. The Balance Sheet exhibits the strong financial position of the Bank and expansion in the right direction. The figures in the Balance Sheet, close upon a crore of rupees, represent the growth of the bank during the short period of the five years it has been in existence, and with the position disclosed we have abundant cause for satisfaction.

OBJECT OF ESTABLISHMENT OF BANK FULFILLED.

If I am not wearying you too much, I think you would like to know, after our five years' working, how far we have fulfilled the objects for which the Bank was established, viz., the financing of local trades and development of industries and commerce. To begin with, you will observe, from the figures of loans, cash credits and bills discounted, that over 61 lakhs are outstanding on the 31st December, 1918. The whole of this sum represents advances within the State. During the past five years our total advances of all kinds have exceeded 80½ crores, and our cash turn over 61 crores. These are large figures indeed for a young Bank of but five years standing, but they clearly exhibit the extent to which we have assisted our merchants and the necessity that existed for a Bank like ours. That the Bank has been able to put through transactions of so great a volume testifies to the ability, care and resourcefulness with which the affairs of the Bank have been managed during the difficult times we have passed through.

RESULTS FOR QUINQUENNIAL.

The result of our working for the quinquennium has been a profit of Rs. 11 lakhs of which sum 43 per cent has been distributed to shareholders, 54 per cent put to reserves and the remainder to writing down our investments and annual bonus to staff, &c. Our constituents, besides the 1,300 shareholders, now number over 5,000. I trust this brief survey of our work will convince you of the safety of your investment in the Bank.

DEMAND FOR SHARES OF BANK.

There is a demand for our shares at Rs. 80 for the Rs. 50 share paid up, and I see no reason why

they should not appreciate still further. I would here like to make the suggestion to shareholders to first ascertain from the manager the market value of their shares before disposing of their holdings privately.

PROSPEROUS CONDITION OF THE COTTON CULTIVATOR.

At our last meeting I referred to the extremely prosperous condition of the cotton cultivators in the State—a prosperity which has been enhanced by the still higher prices which their raw product realized during the year, reaching a maximum of Rs. 560 per candy in September, with a minimum of Rs. 365, but I believe with practically little business passing at the lower figure, which was touched only in the latter months of the year when the depression in the Bombay cotton market was at its height. The out-turn of the crop totalled over 40,000 bales of 400 lbs., the same as in the previous year with an average price for the year of Rs. 398 per bale for mungari and Rs. 420 for compts. Owing to bad seasonal conditions the out-turn of the new crop is expected to be about 62 per cent of last year's (*i.e.*) about 25,000 bales. The unusual prolongation of the local cotton business, well into the second half of the year, helped to employ our funds profitably.

LARGE TRADE IN PIECEGOODS AND YARNS.

Our merchants have conducted a very large business in yarns and piece-goods, and very high prices were touched at the height of the made speculation in August and September, after which date the inevitable reaction set in. I am pleased to say that the condition of the local piece-goods market has since considerably improved and weak holders have been eliminated. Also, the mofussil demand during the past six weeks has been satisfactory. The value of piece-goods and yarns imported last year into Bangalore City alone amounted to 88½ lakhs rupees as against 60½ in 1917, and an average of Rs. 46 lakhs for the two previous years. The prevailing high prices during 1918 are partly accountable for the large increase in values but if we take the weight of cloth imported into the State I find that there is an increase of 28,000 mds. over 1917. In connection with our advances against piece-goods and raw cotton in the Bank's custody, I can tell you that, after a careful examination by a special committee of the Board, they were found fully secured with good margins. In no case did we encourage speculation by making advances to parties recently started in business, but confined our loans to established firms who have always been our constituents. I will not weary you with the detail figures of exports and imports of the remaining commodities which I have been accustomed to

mention in my annual review of the trade of the State, but it is satisfactory to observe, in spite of increased railway restrictions and poor seasonal conditions, that the trade of the State during 1918 in these particular commodities shows no falling off, but rather an increase in volume of 627 lakhs of railway maunds over 1917.

INCREASE OF DIVIDEND.

We celebrate our fifth anniversary by declaring a 10 per cent dividend per annum for the half-year just closed making 9 per cent for the whole year—an important stage in our progress from which we confidently hope there will be no falling back. And gentlemen, it cannot be said that the payment of so satisfactory a dividend has been made at the expense of our Reserve Fund. We have always had before us the creation of strong and liquid reserves, and I think there will be few to criticize our action in having brought our reserve fund up to 42 per cent of our paid-up Capital within five years. For 1918 we have placed out of our net earnings Rs. 1,45,000 to the Reserve Fund, and this represents about 64 per cent of our net profits. For each of the two previous years we put aside a lakh, so that you see there has been no attempt to increase our dividend at the expense of a smaller allocation to the Reserve Fund.

SECURITY OF ADVANCES—OUR PARAMOUNT CONSIDERATION.

The safety of our advances and the strengthening of the Bank's financial position have always been, and will continue to be, our paramount consideration. Now, if you will refer to the figures on the liability side of the balance sheet, you will observe that our working resources almost touch a crore of rupees, a figure which I am happy to state has since been passed.

LARGE DEPOSITS FROM THE PUBLIC.

Our Fixed Deposits aggregate 57 lakhs and floating account 25½ lakhs, in which latter total I do not wish you to imagine that Government balances form any considerable proportion. These figures represent the splendid support we enjoy from the public, to whom we tender our best thanks, and anything we can do to still further increase the usefulness of the Bank we will be most pleased to consider.

SPECIAL CONCESSION TO CONSTITUENTS.

While on this subject, I may mention that we contemplate in the case of fixed deposits for one year to play interest quarterly, whenever such a course is demanded at the time of deposit.

STRONG CASH AND INVESTMENT POSITION.

To revert to the Balance Sheet, on the Asset side cash on hand amounting to 24½ lakhs represents 96

per cent of our demand liabilities and combined with our investments, aggregating 11½ lakhs and which are of the most liquid nature, being short deposits in the Presidency and Exchange Banks and 5 and 5½ per cent Government of India War Bonds, we exhibit a degree of financial strength second to no Bank in India, *viz.*, a percentage of 44 per cent to liabilities of all kinds, and if we exclude the Government deposit of 10 lakhs which is not due for repayment till 1923, the percentage is raised to fifty.

ORIGINAL GOVERNMENT CONCESSIONS.

In connection with the original concessions which the Government of His Highness the Maharaja were pleased to grant the Bank on its establishment in 1913, I should mention that the annual contribution of Rs. 10,000 per annum towards working expenses ceased last May 1918. and this year's profit of 2½ lakhs is minus last year's proportionate contribution of Rs. 6,666. Another matter which I think you should be acquainted with is that the Government have not thought fit to continue the same rate of interest which they originally quoted us for their 5 lakhs deposit. This rate, after remaining at 3 per cent, up to 1916, was raised to 4 per cent for 1917 and again raised to 4½ per cent for 1918-19. This means that instead of paying Government Rs. 15,000 as 3 per cent interest on 5 lakhs we are now paying Rs. 22,500—an increase of no less than Rs. 7,500 annually. I mention these two particulars only to show that we are not the spoilt child of Government which some people imagine us to be, and that the results of the past year's profits are therefore in every way eminently satisfactory.

SEASONAL OUTLOOK.

The future agricultural outlook is far from reassuring. Tanks are dry, and drinking water is scarce. Fodder has risen considerably in value and is difficult to obtain. The situation is a serious one, and the next rains will be awaited with the greatest anxiety.

STOPPAGE OF GRAIN TRADE.

During the greater part of the last quarter the free trade in rice, paddy, ragi and Jawaree was practically stopped owing to Government commandeering foodstuffs. I shall not here dwell on the necessity for this action of the Government and the fixing of low rates for local produce out of all relation to those prevailing outside the State. There is less objection to the restrictions imposed on exports from the State, but restrictions to the extent of stopping the free movement of grain within the State have been productive of consequences which are worse than the original evil, and it is to be hoped that such action has not alarmed cultivators of food-

stuffs into sowing other crops, not likely to be commandeered in the future, and which, also, have been more profitable than the cultivation of food grains. The restrictions of free internal movement have now to some extent been removed. but I still hear of merchants finding it difficult to import local rice and ragi into Bangalore.

SECOND WAR LOAN SUBSCRIPTIONS THROUGH THE BANK.

As you are aware the Government of India were again last year borrowers to an unlimited extent for financing the war, and were successful in realizing over 51 crores from their main issue, *i.e.*, exclusive of receipts through the Post offices. In this state the total subscriptions touched 16½ lakhs, besides the 30 lakhs taken up by the Durbar. No less than 15½ lakhs of this total passed through the Bank representing 2,900 subscribers and it speaks well for the financial position of the applicants that, in spite of the most favourable concessions offered by our Bank, our advances this year, only touched 3½ lakhs as against 7½ lakhs in the previous year and of which latter amount Rs. 20,000 only now remains outstanding. I feel certain the circulation of Government securities to the extent of 20 lakhs in this state within 2 years cannot but result in a better appreciation by the public of the advantage of a safe and readily negotiable investment.

INDUSTRIAL COMMISSION REPORT.

Another event of considerable importance has been the issue of the report of the Indian Industrial Commission appointed to examine and report upon the possibilities of further industrial development in India. The recommendations of the Committee are of a most interesting, and what is more to the point, of a practical nature. There is not a single trade or industry that is not deeply concerned with the conclusions which the Committee have arrived at. As a Bank we are much interested in the recommendations submitted in Chapter XX on Industrial Finance especially those referred to in para 293. The proposal of rendering financial assistance in the form of a cash credit by Banks on the recommendation of the Director of Industries and Commerce and the guarantee of the Government of India has already been the subject of discussion between our Government and the Board and we have expressed our willingness to act in accordance with the recommendations of the Commission.

INTRODUCTION OF THE MYSORE PAPER CURRENCY (EMERGENCY) REGULATION.

Another important matter, and one that perhaps few of you are aware of, is the introduction of the Mysore Paper Currency (Emergency) Regulation No XI of 1918 making Government currency notes

as issued by the Government of India now legal tender in the State. The Government of India prohibition of the free movement of specie by rail in the State, except under a special license from the Accountant-General, is probably the reason for the introduction in 1919 of the Regulation, in question but while the position of Banks is greatly strengthened there is not likely to be any diminution of the difficulties I referred to in my speech last year in the encashment of currency notes, and it is desirable that the Durbar should come to some working agreement with the Government of India for the creation of a special currency reserve within the State to meet the requirements of the public and mercantile community. The continuances of the issue of the smaller notes while defensible as a war measure is in no way desirable. The experiment cannot be described as a success, and the withdrawal of these notes will, I am sure, result in a complete return of the public confidence which the larger issues enjoyed before the war and the return into circulation of a great portion of the 100 crores of new rupees minted during the war.

THE RETIRING DIRECTORS.

As stated in the Agenda for our meeting to-day shareholders are called upon to elect two Directors in the place of those who are retiring by rotation. Rao Bahadur Mr. B. P. Annaswamy Mudr. C.I.E., has expressed his intension to withdraw by reason of the heavy calls on his services in the Cantonment. He has been a Director of your Bank for the past five years, and been most regular in his attendance at our Board meetings. His wide experience has been freely placed at our disposal and, on behalf of my colleagues as well as the shareholders, I tender him our sincere thanks for his services and hope that he may be long started to continue the good work he is doing in the Civil and Military Station.

The other retiring Director is our well-known citizen Mr. B. K. Garudachar. He has been on the Board from the inception of the bank, and all I can say of his work on the Board is that he has proved himself invaluable to us. His knowledge and experience of affairs in the city is unique, and he cannot do better than re-elect him unanimously.

The position of a Director on the Board of a Bank is regarded as one of some distinction, and it is too much to expect a Director to canvass for the votes of shareholders with a view to secure his own re-selection. There are only two candidates in the field and you have an easy task before you. The only other candidate offering himself for the vacant seat is Mr. Tubagere Nanjappa and for whose election the usual proposal will be submitted for your approval.

THANKS TO MANAGER AND STAFF.

Our Manager Mr. W. C. Rose has steered the Bank through the troublous times of war with a steady and firm hand, which was even more plainly discernable in the manner in which he conducted the affairs of the Bank in the recent cotton and piece goods crisis. But for his sound advice, always willingly given, many a speculator would not have fared so well. His profound knowledge of Indian Banking conditions, his devotion to the interests of the shareholders and above all his sympathy for the public have made an impression upon the Directors. The Bank staff and the Agents have worked well and given satisfaction.

Before I move the adoption of the Directors' Report and audited balance sheet for the six months ended 31st December 1918, I shall be pleased answer any questions and give any further information desired on the accounts now before you.

ADOPTION OF THE REPORT.

On the motion of the Chairman, only seconded by Mr. M. L. Vardhamanah and unanimously carried, it was resolved:

"That the Report of the Directors and the statement of accounts of the Bank up to 31st December 1918 be adopted."

DIVIDENDS.

On the motion of Rao Bahadar Deshmukh Shama Rao, duly seconded by Mr. Ahmed Sait and unanimously carried, it was resolved:

"That the payment of a dividend at the rate of 10 per cent. for the half-year ended 31st December 1918, making an average of 9 per cent. for the whole year and the allocation of Rs. 70,000 to the Bank's Reserve Fund, bringing up the said Fund to Rs. 4,20,000 out of the net profits of the half year, be approved."

STATISTICS.

World's Productions of Petroleum.

The following appears in the *Board of Trade Journal*.—The increasing demand for petroleum and its products, both in the United States and the world at large, is brought out in a compilation by the National City Bank of New York showing world production of petroleum and the share thereof by the United States from the earliest date of that industry down to 1917.

This compilation shows that the United States in 1917 produced 342,000,000 barrels of crude oil,

against 300,000,000 in 1916, 210,000,000 in 1910, and 64,000,000 in 1900, and that it now produces two-thirds of the oil of the world.

Of the world's output of crude petroleum, the United States supplied 66 per cent in 1916, against 64 per cent in 1910; 43 per cent in 1900, 60 per cent 1890, and 88 per cent in 1880.

The production of petroleum in 1916 is given at 461,000,000 barrels of 42 gallons each, against 427,000,000 barrels in 1915; 328,000,000 in 1910; 149,000,000 in 1900; 77,000,000 in 1890; 30,000,000 in 1880; 6,000,000 in 1870, and about a half a million barrels in 1860. The world production of 1917 is estimated at about 500,000,000 barrels.

PRODUCTION IN 1917.

The production of petroleum in the United States 1917 was larger than in any earlier year, exceeding that of 1916 by 42,000,000 barrels. The world production in 1916 was larger than in any earlier year, exceeding that of 1915 by 34,000,000 barrels. For 1917 there are no complete figures of world production owing to the absence of data on production in Russia and Roumania in that year. While presumably there was a large decline in production in Russia in 1917, the fact that the United States output increased about 40,000,000 barrels and that of Mexico increased 16,000,000 may make the total world production of 1917 about 500,000,000 barrels.

COMPARISON WITH RUSSIA.

The United States has been the world's largest producer of petroleum continuously since the development of the petroleum production, except in the period 1898-1901, in which Russian production slightly exceeded that of the United States, the product of the United States in 1898 being 55,000,000 barrels, Russia 62,000,000; in 1899, United States 57,000,000, Russia 66,000,000; in 1900, United States 64,000,000, Russia 76,000,000, and in 1901, United States 69,000,000, Russia 15,000,000.

Beginning with 1902, however, the product of the United States exceeded that of Russia by 8,000,000 barrels, and in 1914 it was nearly four times as much as that of Russia—the 1914 figures of production being for the United States 266,000,000 barrels, against 67,000,000 barrels produced by Russia.

Russia's largest production in any one year was in 1901, 85,000,000 barrels, falling to 67,000,000 in 1914, while in the case of the United States, the product of 1901 was 69,000,000 barrels, having advanced meantime to 266,000,000 in 1914, 292,000,000 in 1915, and to 300,000,000 barrels in 1916 and 342,000,000 in 1917, the United States figures for recent years being those of "marketed product."

The United States' share of the world's petroleum production was in 1860 98 per cent; in 1870 91 per

cent; in 1880 88 per cent; in 1890 60 per cent; in 1900 43 per cent; and in 1910 64 per cent; and in 1916 66 per cent, these figures being in very round terms.

WORLD'S PRINCIPAL PRODUCERS.

The world's principal mineral oil producers and their output in 1916 were: United States, with a product of 300,000,000 barrels; Russia, 75,000,000; Mexico, 40,000,000; Rumania, 1,000,000; Dutch East Indies, 13,000,000, and India 8,000,000 barrels.

The principal production of the United States by States was, in 1916, California, 91,000,000 barrels. Oklahoma, 107,000,000; Illinois, 18,000,000; Texas, 28,000,000; Louisiana, 15,000,000; West Virginia, 9,000,000; Ohio, 8,000,000; and Pennsylvania, 6,000,000, the figures being in very round terms. The chief increase in 1917 occurred in the "Oklahoma-Kansas" district, which showed a gain of 32,000,000 out of the total gain of 42,000,000 barrels in the United States in 1917.

The United States, despite the fact that she is by far the world's largest producer of petroleum, is becoming of late a considerable importer, the quantity of crude petroleum imported in the fiscal year 1915 being 652,000,000 gallons, in 1916, 871,000,000 and in 1917, 1,079,000,000, a very large proportion of this coming from Mexico and seeking a market in the United States because of her superior facilities for refining the crude product.

SERICULTURE.

Progress In Kashmir State.

We take the following extracts from the Annual Report on the Administration of the Jammu and Kashmir State for the year 1914-15, just published:—

The working of the department in Sambat 1971 was very seriously affected by the outbreak of War, which practically put an end to all sales, besides causing a great increase in freights and insurance rates. The European market was almost closed and efforts to increase sales in India did not meet with much success. It does not seem likely that the enquiries made from firms in Burma and Siam will lead to much business, but the steps taken with a view to making direct sales in the American market may possibly have important results.

SERICULTURE.

The quantity of seed distributed during the year was nearly the same as in Sambat 1970, viz.,

36,008½ oz., but the cocoon crop was rather below the average (36½ seers per oz., of seed) owing mainly to a spell of cold weather at the beginning of the rearing season, and afterwards the epidemic of cholera. The local seed again gave better results than that imported. It amounted to a considerable proportion of the whole, rather more than 10 per cent in the year under report, and the amount is being increased considerably this year. Silk rearing in Skardu again gave inferior results; the experiment is hardly worth continuing, but a few men wish to make a further trial and this will perhaps be arranged. Increase in the number of rearers from 47,501 to 48,936 shows that the competition for seed is getting keener every year. The new filatures to replace those destroyed by fire, were still under construction, and the outturn of the factory was, therefore, far less than in former years, cocoons reeled being 7,822 maunds 32 seers 2 chitaks or almost exactly one-quarter of the amount reeled in 1969, the last year of full working. It is satisfactory to note, however, that the decrease in cocoons reeled was accompanied by a marked increase in the outturn per maund of No. 1 silk (6 lbs. 13 oz. 9 dr. against 5-13⁵/₁₆ in Sambat 1970) due chiefly to closer supervision of the reelers. The total outturn was 78,323 lbs. 10 oz. 11 dr. (53,596 lbs. 12 oz. 5 dr. No. 1 and 24,726 lbs. 14 oz. 6 dr. inferior) as compared with 168,828 lbs. 5 oz. 0 dr. (94,978 lbs. 1 oz. 0 dr. No. 1 and 73,850 lbs. 4 oz. 0 dr. inferior) in the preceding year. The completion of the new filatures has been delayed by the difficulty of deciding between steam and electricity for heating the basins: as the results of experiments carried on for some years past, it has been established beyond doubt that electric heating can be employed with success, and that it is in some respects superior to steam heating. The question which was thus narrowed down to one of comparative cost, has now been finally settled by the Darbar in favour of the former. The new filatures when completed, will be in many ways an improvement on the old ones. As already stated the market was entirely upset by the War, and the total sales amounted only to Rs. 1,86,791 against to Rs. 23,29,694 in Sambat 1970, but the latter was an exceptionally high figure. The preliminary balance sheet shows a small profit of Rs. 3,329 on the year's working, a better result than for Sambat 1970, but a very poor one if comparison is made with the preceding years. This is due of course to the fire and the War.

JAMMU.

Silk rearing was extended to 12 of the 16 tehsils of the province. With approximately the same amount of seed, the number of rearers increased slightly and the outturn rose from 27 seers per

maund in Sambat 1969 and 23 seers in Sambat 1970 to 29½ seers in Sambat 1971, the amount of cocoons being 3,002 maunds against 2,316 in the previous year. This is much the largest crop secured so far, the largest previously being 2,007 maunds in Sambat 1969. The Kashmiri *girdawars* continued to do useful work. The seed in this province was all imported, excluding a few ounces of local Kashmir seed which gave very poor results. The Director comments on the length of time between the despatch of seed from the Hibernation House at Batote and its receipt by the rearers, which seems to exceed even a fortnight in some cases and exceeds a week in most and he contrasts with this the care taken in Italy to avoid an hour's delay in transit. It is indeed remarkable that fairly good results can be obtained where the delay in distribution is so great, but this delay is due to the configuration and poor communications of the province and only admits of partial remedies, one of which is the construction of another hibernation house in the Rajouri hills. In this respect the Kashmir Department has a great advantage. The cocoons were taken over from the rearers at first only at two centres, Jammu and Batote, to which Bhimber was added not long ago. In the year under report four more centres were added to the list to meet the convenience of rearers. This step together with the free but judicious use of the reward system and house building advances should go some way to make silk rearing more popular.

The filatures worked for 264 days against 282 days in Sambat 1970 and 294 in Sambat 1969, the decrease being due to several unavoidable closures for various reasons; and there was also a shortage of labour in the latter part of the year, the result being a fall in cocoons reeled from 10,039 to 6,691 maunds. The total outturn decreased from 16,336 lbs. 8½ oz. last year to 11,669 lbs. 5½ oz., owing, it is said, to the decrease in the number of basins (worked); but this does not account for the decrease in the outturn per maund of cocoons, which in No. I silk has fallen from 5 lbs. 5 oz. to 5 lbs. 1 oz. and this is not explained. As a result of his Italian experience, the Director has, however, been able to make some valuable improvements, *viz.*, introduction of what he calls *nim-gudar*, whereby everything that the cocoons can yield is secured, and the increase of *sarnakh* at the expense of the less valuable *gudar*. The Jammu Department like that of Kashmir, has suffered much from the War, important contracts for the purchase of silk and cocoons being repudiated by the purchasers. On such sales as were completed, the prices were satisfactory, in fact better than any previously obtained; but the total realized fell from Rs. 1,51,472 in Sambat 1970 to Rs. 64,336

in the year under report with a corresponding increase in the stock on hand.

The preliminary balance sheet shows a loss of Rs. 16,736 which is to be regretted, but the special circumstances of the year under report made a considerable loss inevitable. In view of the fact that sericulture in the Punjab (or at least in Gurdaspur) has been definitely pronounced to be a failure, and that the net result of the working of the Jammu Department to date is a loss of Rs. 94,499 it may seem rash to prophesy a successful future for it, but considering that improvements in the working are being effected every year, it may be hoped that as the rearers become more experienced and the subordinate staff more fully realize the spirit in which their duties should be carried out the results will improve gradually and the department show a profit on its working when normal conditions are restored on the cessation of the War.

MULBERRY CULTURE.

The number of nurseries was the same as in the previous year, *viz.* 13, five in Kashmir and eight in Jammu. One of the latter was extended during the year by the inclusion of some additional land, but the proposal for the consolidation of the Lusdana Nursery in Kashmir was dropped, sanction withheld to the acquisition of land required for the purpose. Nursery work continued as usual. Nearly 10,000 trees were distributed in Jammu, but a large percentage is reported to have failed owing to the lack of interest on the part of Zamindars in mulberry planting. To overcome the difficulty, it is suggested that the system approved for Kashmir of plantation in blocks with paid *Malis* to look after the trees in their early stages should be given a trial. In Kashmir the number of trees transplanted was 14,000 approximately, all of which are reported to have survived. Of the total number (about 2 lacs) of trees planted in this province during the last 10 years (Sambat 1902 to 1911) the percentage of survivals is 65 in the Southern Division and 53 in the Northern Division—a somewhat poor result but not wholly unsatisfactory if all the circumstances are considered. The net income of the department from fines and sale of wood was approximately Rs. 5,700. As regards the work of the department in general, it is observed that the system of block plantation and paid *Malis* or guards seems to work well, on the other hand the interest of the Zamindars in mulberry plantation has not yet been aroused and it is feared that the concessions announced some years ago with a view to stimulating it must be pronounced a failure. It is, however, stated that the notices to the effect that the amount of seed given to silk rearers will depend on their interest in mulberry planting, has had a marked effect. On the whole the department is doing useful work under considerable difficulties due to the apathy of the people.

THE SILK INDUSTRY IN INDIA.

Mr. Lefroy's Report.

The report on the enquiry into the silk industry in India which was undertaken by Mr. Maxwell Lefroy, Imperial Silk Specialist and Mr. Ecansorge, C. S., which began in December 1915 has now been published.—

After an exhaustive report they conclude that the diminution in silk production in India is mainly in that of Bengal and is due to (1) the increased production of Japan, (2) disease, (3) the increased value of other crops and (4) the inferiority of the Bengal worm. The silk crop of Bengal is now almost limited to areas in which silk is the most suitable crop with a better race which is now available with the existing resources in nurseries. The industry can be largely revived if the new, hybrid races are introduced and if a competent European officer is appointed to organize the introduction. The industry in Mysore and Kollegal is capable of extension on the same lines and its production of silk can be considerably increased if disease free seed of an improved (probably hybrid) race can be issued from a station situated in a suitable climate. The industry in Kashmir is in no need of any thing but local extension in regard to tree planting and the production of silk nearly at the limit of the existing tree. The question of developing seed supply must depend on the conclusions reached by the imperial agricultural bacteriologist on the pebrine question. The small industries in Assam and Burma are capable of considerable extension with better races of seed better plant. New areas for silk production are being tested. There is large scope for development in the Punjab the United Provinces and Bihar submontane tracts but this will require extensive organisation at the start and will develop slowly. Other areas for silk production are uncertain and can be tested only by continued experiment. The development of the industry depends primarily upon continued expert organization and a seed supply. With an expert organization and with a source of seed in India there can be a large extension in Bengal and Mysore, some extension in Assam and Burma, a steady growth probably in Northern India all likely areas in India can be tested. The ultimate limit of development is a perfectly definite one decided by climatic and economic conditions, the latter of which are not yet ascertained for all parts of India. But it is probable that a very large increase in production is possible and may be confidently looked for if competent organization is applied through ordinary channels. The expenditure involved is

small and the lines of progress are definitely ascertained. The detailed minor Improvements in each area are indicated above. The broad requirement is the provision of an expert organizing staff and a central seed-producing station. There has been a diminution in the Tasar industry due mainly to the increased value of food crops, partly to the better control of forests and partly to the decreased demand for Tasar goods. The production of cocoons can be assisted only by a prolonged investigation into the biology of the insect, the result of which must be uncertain. The position of the Tasar producer is not such as to justify this investigation, and it is not worth undertaking. The closely related industry of Tasar weaving can be assisted probably only by the provision of organization in the disposal of fabrics, better methods and extension of co-operative credit. The latter is the most vital, the Tasar worker being very generally hopelessly indebted and unable to work under present conditions. The industry is a very scattered one and will be difficult to organize on that account, but it is very large and falls chiefly within a single province. Its production is not exported and the position of the industry is a matter wholly of local concern. No real effort to assist the industry has been made during the last forty years and there is probably good scope for development on co-operative lines. This could be easily done and the cost would be fully justified by the results.

The Muga and Eri industries are small and practically confined to Assam. They are capable of improvement with expert advice, but will, probably, never develop to large proportions. Eri might possibly become a large industry if the use of Indian raw materials was developed in England. The production of silk cocoons of all kinds and the disposal of the produce can be considerably developed by the provision chiefly of an expert organization similar to that of the agricultural departments in India and it is essential that this organization shall also be in close touch with the manufacturing part of the silk industry. The question of the utilization of silk and the development of the silk weaving industry is less simple than that of silk production. The decline in the export of manufactured silk, and the growth in the imports of manufactured silk or due to the continuance of defective methods in India, bad economic conditions, want of organization in India, and the increased cheap production (probably due to better organization of weaving) in Japan. The export of manufactured silk from India is unlikely to be considerable unless the industry can be organized and the existing methods improved. This will be possible **only** by such an extension of co-operative credit among the weavers as will make them

independent of the employers who have prevented improvement and resisted organization and it will require a combination of expert advice, commercial organization and co-operative credit extension that will be extremely difficult to apply. It is uncertain if the Indian worker will ever be able to compete successfully and work for an export trade. It is more likely that the extension of weaving will be limited to meeting the internal demand except on such articles as require fine imported raw materials. The best deciding factor of this is the question of how Japan is able to produce silk fabrics cheaper than is now possible in India and it may be that it will ultimately be decided that it will be impossible ever to develop the export of manufactured silk. The inquiry into the production in Japan has yet to be made. It is certain that the Indian weaving industry suffers in competition with other countries in its defective methods, in the deplorable position of the workers, in the excessive profits made by the dealers and employers, in the lack of ordinary business organization and commercial enterprise. Defective methods cannot be remedied until the actual craftsman can be put in a position to adopt better ones and the Indian weaver can probably compete successfully if he can be properly financed organized and developed. To do this requires, first, the means for experimentally producing silk fabrics, secondly, capital with which to finance the development and the production of better goods; thirdly, thorough local inquiry into the circumstances of the weavers and the means of organizing them, and fourthly, a co-ordinating organizing staff whose operations can extend all over India and who can stimulate trade development provincially and outside India. In doing this it is essential that the ordinary commercial methods are adopted and that considerable sums of money are risked until the production and sale can be taken over by commercial agency. The ordinary business of trading must be done by the State and some further experience is required to definitely ascertain in what areas better methods, proper economic conditions and good organization will enable the Indian weaver to successfully produce the articles now in demand.

Some area such as Burma, are far more promising than others and there is justification for the belief that if a real effort is made with sufficient capital, the greater part of silk required can be produced in India and that possibly an export trade can also be created. It is useless to ignore the difficulties. It is also certain that nothing but a real businesslike effort will achieve anything. The mere creation of the schools, institutes, etc., will do nothing. It will be easy to have large permanent staff and to really achieve nothing and it is unlikely that any solid

progress will be made during the first year or two. The best plan is to provide the organization and to attempt to reorganize the industry in suitable areas with a combination of local effort and central advice commencing on small lines in suitable places. The organization required for this is discussed and the creation of a central silk institute to work with provincial silk assistants is recommended. In the first place, this should be limited to the provision of a seed supply station in a suitable climate. The necessary staff for hybridizing for seed production and for the supervision of rearing experiments, should be provided and there should be an officer in the imperial service whose advice should be available to all provinces and states on the improvement, and development of silkworm cultivation. This having been provided, the development of weaving should be considered and the action that will be taken by local Governments will determine how far it will be necessary to provide the staff of the central silk institute suggested, also that the inquiry suggested should be undertaken before any development is commenced. For the first year probably the expenditure in this direction will be small, but if provincial Governments generally agree to the proposals and the work commences to develop, the staff of the institute will be required and buildings and appliances will need to be provided for, including non-recurring expenditure and capital. The amount required annually during the first four years should not exceed Rs. 1,50,000; in recurring expenditure it should not exceed Rs. 75,000 in the first year and rise to Rs. 1,50,000 in about four years. "I am assuming that nearly all provinces develop their silk industry and that the full scheme is worked up to. It is impossible to lay down rigidly what the development should be. Two things are absolutely essential. The first is that the officer responsible shall be given as much freedom as possible in deciding in what direction to make progress first and shall not have his budget too minutely sub-divided. The second is that it shall be recognized that progress will be slow and that it is useless to embark on any development at all unless it is likely to be persisted in for a period long enough to really test its value. If success is to be achieved it will require a steady effort maintained for more than one generation and during this time many methods will need to be tried and there will be some failures."

MYSORE ECONOMIC CONFERENCE

EDUCATION COMMITTEE.

Brief report of the work done during half year ending 31st December, 1918.

I. During the period under report, the following schemes chiefly engaged the attention of the Committee:—

1. Hostel accommodation for A. V. Schools.
2. Publication of a Ladies' and a Children's Magazines.
3. Popular Science Lectures.
4. A scheme of Physical Culture.
5. The subject of introducing industrial subjects into the S. S. L. C. course.
6. Development of the scheme of Public and Travelling Libraries.
7. A revised scheme for a Music school at Mysore.
8. Distribution of the scholarships to students of backward and depressed classes.
9. Reorganization of the Weaving Schools in the State.
10. Subjects of the Representative Assembly re free-studentships to the students of the Devanga and Mahomedan communities.
11. Opening an Industrial Teacher's class for girls in the Girls' High Schools, Bangalore.
12. Education of adult women by means of public lectures.
13. Scheme of popular lectures in the Taluks.
14. A new Physical Culture Class.
15. Scholarships for Malnad boys.

II. Experimental Work.

(1) LIBRARIES.

(a) Public Libraries of Bangalore and of Mysore.

(a) *The Bangalore Public Library.*—Arrangements have been made to open a Ladies' and Juvenile section, to appoint a qualified Librarian and to utilise the whole of the Seshadri Memorial Hall for the purposes of the Library. The books have been classified according to the Dewey Decimal system, and the new catalogue embodying the necessary changes is in Press. An audit of the accounts of the Library was ordered.

(b) *The Mysore Public Library.*—The appointment of a graduate Librarian to the Library is recommended. A Ladies' and Juvenile section has been opened and is becoming popular.

(b) Rural Libraries.

There was no progress under the Rural Library Scheme since no grants were sanctioned for these Libraries owing to the non-receipt, from the Deputy Commissioner Presidents, of the requisite periodical reports and returns.

People in rural areas have been enthusiastic in coming forward with contributions for founding and developing Libraries in villages. The Committee have accordingly recommended grants to the Libraries in the Districts of Hassan, Kolar and Kadur. A revised and enlarged catalogue of Kannada books and periodicals approved for the use of these Libraries was issued (1918).

(c) Taluk and District Libraries.

The Committee sanctioned grants to the Taluk Libraries of Arsikere, Belur and Hole-Narsipur.

(d) Travelling Libraries.

Every District Committee was provided with the necessary Travelling Library requisites, such as, sets of book-cases and of Kannada books, registers, copies of rules, forms, etc. Government were pleased to approve of the sale of Travelling Libraries to villages at half cost (G. O. No. 1730-40—Edn. 14-17-100, dated 20th August 1918).

Three Urdu Travelling Libraries have been formed for the benefit of the Mahomedan population of the state.

(2) HOME INDUSTRIES CLASSES.

Thirty-four new classes were opened during the half year bringing up the total to 131. A special Tailoring class was opened in the H. I. Institute, Bangalore. The audit report of the accounts of the Institute is being considered by a Sub-Committee. The Education Committee resolved at their meeting on 21st December 1918 that the Home Industries classes, one year old and the two Institutes at Bangalore and Mysore be handed over to the Education Department.

As the provision of Rs. 25,000 allotted for the Home Industries classes during 1918-19 was found insufficient an additional amount of Rs. 3,000 was reappropriated. The classes working in the Chitaldrug District were inspected by the Secretary in the month of September. The Home Industries Institute, Bangalore, registered 39 home workers during the period under report while the Mysore Institute registered 84; the sale proceeds realised from manufactured articles were Rs. 830-9-0 and Rs. 477, respectively.

The Institutes and the classes were awarded 21 medals, 17 certificates and 3 prizes.

The deputation of a lady to the Phillipine Islands to undergo special training in Home Industries was

also resolved upon by the Committee and recommendations made to Government since the close of the half year.

(3) POPULAR SCIENCE LECTURES.

Regarding Popular Science lectures, the Kannada Popular Science Association having intimated that the lectures failed to attract sufficient audience, a note of suggestions was prepared by Dr. M. Srinivasa Rao and forwarded to the Association for adoption. Some further suggestions were made by the Science Education Sub-Committee.

(4) PHYSICAL CULTURE.

A physical Culture expert was appointed and a class started at Bangalore. Regular work was commenced in January.

(5) ADULT EDUCATION OF WOMEN.

Further details in regard to the Education of adult women by means of lectures and the revision of the scheme of backward classes scholarships are being worked out.

One meeting of ladies was held and interesting lectures were delivered by Srimati Srirangamma, B.A., and others.

III. Publications,

Seven publications were undertaken. Four compilations, one bulletin, one lecture, and one Quinquennial Summary (Part II.)

They are as follow :—

- (1) Educational Statistics of Japan and Mysore, compared :
- (2) Mysore Students Abroad ;
- (3) Schools of Public life (a brief account of Assemblies and Committees in Mysore) ;
- (4) Translation of 'careers and courses.'

(The first two are ready.)

- (5) and (6) A Bulletin on plague and a lecture on Printing in Mysore were published.
- (7) Quinquennial Summary (Part II) is nearly ready.

IV. Dasara Activities.

The work during the last Dasara was confined only to lectures on account of the Influenza epidemic. Only one lecture was delivered. Subject: Progress in Mysore after the Rendition.

V. Sub-Committees, their meetings and the Subjects discussed :—

1. Industrial Education ; 2 Meetings.

(a) Supply of Electrical appliances to the Home Industries Institute, Bangalore.

(b) Conversion of General Education Schools into Polytechnic Institutions.

- (c) Introduction of compulsory Industrial instruction in Lower Secondary Schools.
- (d) Deputation of a lady to Phillipine Islands to study the Home Industries.
- (e) Transfer of the management of Home Industries Institute at Bangalore and Mysore and such of the classes as are more than a year old to the Education Department.
- (f) Additional grant of Rs. 3,000 for the Home Industries classes.
- (g) Recommendation to Government that the Home Industries classes be run as Government Institutions.

2. Library Sub-Committee : 2 Meetings.

- (a) The Committee recommended grants to several Libraries at Chitaldrug, Arsikere Belur and Nelamangala and other places.
- (b) Appointment of a Chairman for the Committee for the management of the Public Library, Mysore.
- (c) Applications for the post of the Librarian at Bangalore and the appointment of a graduate Librarian for the Mysore Public Library, considered.
- (d) The establishment, house rent, etc., for the ladies' and Juvenile section.

3. Scholarship Sub-Committee : 1 Meeting.

- (a) Developing Panchama Education.
A recommendation was made to Government regarding the further facilities to be provided.
The establishment of a boarding school at Mysore for Panchama girls is still before the Committee.
- (b) The distribution of scholarships to students of backward and depressed classes.

4. Female Education : 2 Meetings.

- (a) Measures to be adopted for the encouragement of higher Education.
- (b) Introducing industrial subject into girls' schools.
- (c) Revising curricula of studies for girls' schools.
- (d) Instituting a special faculty and special degrees for women.
- (c) Boarding schools for girls.

5. Miscellaneous Subject : 1 meeting.

- (a) The question of granting special scholarships to malnad students receiving. Secondary higher and Professional Education is still before the Committee and some other subjects were also discussed.

- (b) Recommended the encouragement to be given to the author of Samaja Dharmada Kaipidi.

6. Science Education : 1 meeting.

The question of organising Kannada Popular lectures in Science made several new suggestions.

7. Special Committees.

Hostel Accommodation : One Meeting.
Mysore Annals : Three Meetings.
Boy Scouts : Two Meetings.
For selecting Economic Lectures : One Meeting.
Ladies' Magazine : One Meeting.

Summary.

No. of subjects discussed	...	...	63
No. of recommendations made to Government	...	...	40
No. of recommendations sanctioned by Government	...	...	20
No. of notes drawn up by members	...	...	11

V. SUBRAHMANYA IYER,
Secretary.

Brief Report of work in January.

I. Home Industries.—The Instructor of the Tailoring Classes in the Home Industries joined duty on 1st October 1918. But regular classes could not be held at once on account of influenza in the City. There are now 12 on the rolls. The continuance of the Instructor's services has been sanctioned till the end of February 1919. Fair progress has been made.

Recommendations were made to Government—

- (a) For transferring all the Home Industries classes and of the Home Industries Institutes at Bangalore and Mysore to the Educational Department.
- (b) For deputing B. Nanjamma to the Phillipines to study the methods of developing and organizing Home Industries there.

Applications were invited from qualified persons by notification in the Gazette, for the place of the Superintendent of the Home Industries Institute, Bangalore, temporary arrangements being made for the work of the Superintendent.

II. Physical Culture.—The Physical culture class sanctioned by Government was opened on the 2nd instant. There are at present over 100 pupils. The Inspector General of Police has sent 22 pupils

from the Police Training School and the Inspector General of Education 10 pupils from the Normal School, for training. About 90 pupils from other schools were selected. The class was being held in the premises of Police Training School at first. For want of sufficient accommodation, it has now been shifted to a rented building near the Fort.

III. City Economic Lectures.—Mr. H. K. Mallappa, the Economic Lecturer for Bangalore City, reverted to his appointment from his work in connection with war recruitment. He has since then delivered 3 lectures on 'Duties of women' and the 'Depressed classes, Employees and their Union' and 'Duties of men.' The Committee have recommended his appointment as Lecturer for both the Cities of Bangalore and Mysore.

IV. Libraries.—The appointment of a graduate Librarian for the Mysore Public Library and a graduate Librarian for the Bangalore Public Library as well as the continuance of the Ladies' and Juvenile section of the Mysore Library for a further period of 2 years were recommended to Government.

The appointment of Mr. N. S. Subba Rao as Chairman of the Committee for the Mysore Public Library and the appointment of Mr. B. M. Srikanthaiya as the Officer in charge of the Library were also recommended to Government consequent on the resignation of Mr. Humza Hussain of the Chairmanship. This recommendation has since been sanctioned by Government.

V. SUBRAHMANYA IYER,
Secretary.

RECONSTRUCTION IN ENGLAND.

Reform in State Machinery.

The Report of the Machinery of Government Committee of the Ministry of Reconstruction has been issued as a Parliamentary Paper (Cd. 9230).

The Committee, which consisted of Lord Haldane (chairman), Mr. E. S. Montagu, Sir Robert Morant, Sir George Murray, Sir Alan Sykes, Mr. J. H. Thomas, and Mrs. Sidney Webb, was appointed in July, 1917, "to inquire into the responsibilities of the various Departments of the Central Executive Government and to advise in what manner the exercise and distribution by the Government of its functions should be improved." The Report is signed by all the members of the Committee. It is divided into two parts, the first dealing with the general principles which the Committee suggest for adoption in Government, Departments generally, the second consisting of separate chapters illustrating the appli-

cation of these principles to 10 of the main branches of the business of Government—namely, Finance, National Defence, External Affairs, Research, Production, Employment, Government Supplies, Education, Health, and Justice.

Before dealing with departmental organization the Report refers to the functions and procedure of the Cabinet. While it is agreed that its constitution and methods of procedure must depend on the circumstances of the time, the personality of the Prime Minister, and on the capacities of his Principal colleagues, the main functions of the Cabinet may, it is thought, be described as:—

(a) The final determination of the policy to be submitted to Parliament:

(b) The supreme control of the national executive in accordance with the policy prescribed by Parliament; and

(c) The continuous co-ordination and delimitation of the activities of the several Departments of State.

For the due performance of these functions the following conditions are considered to be desirable:—

(i) The Cabinet should be small in number—preferably 10, or at most 12:

(ii) It should meet frequently:

(iii) It should be supplied in the most convenient from with all the information and material necessary to enable it to arrive at expeditions decisions:

(iv) It should make a point of consulting personally all the Ministers whose work is likely to be effected by its decisions: and

(v) It should have a systematic method of securing that its decisions are effectually carried out by the several Departments concerned.

It is pointed out that during the war an briefly new type of Cabinet was evolved with the methods of procedure and the opinion is expressed that probably the constitution and procedure of the War Cabinet will not be found entirely suitable to peace conditions. A rearrangement of the supreme direction of the executive organization as it formerly existed has however, been recodered necessary, not merely by the war itself, but by the prospect after the war. Such a rearrangement has been attempted, and the question whether it has yet assumed an adequate from, or works as efficiently as it might, is quite a different question from whether it is possible to return to the old order of things. The latter question, the Committee feel must be answered in the negative. The Report continues:—

Whether the new type of Cabinet should consist of Ministers in charge of the principal Departments of State, or of Ministers—"without portfolio" able to concentrate their whole attention upon the problems submitted for consideration, or of Ministers of both kinds, are questions which we do not propose to discuss here. But we think that there is one feature in the procedure of the War Cabinet which may well assume a permanent form namely, the appointment of a Secretary to the Cabinet charged

with the duty of collecting and putting into shape its agenda, of providing the information and material necessary for its deliberations, and drawing up records of the results for communication to the Departments concerned.

With regard to the formulation of policy, the Committee have come to the conclusion that in the sphere of civil Government the duty of investigation and thought, as preliminary to action, might with great advantage be more definitely recognized. It appears to them that adequate provision has not been made in the past for the organized acquisition of facts and information, and for the systematic application of thought, as preliminary to the settlement of policy and its subsequent administration. The principle ought by no means to be limited in its application to military and naval affairs. It will not be possible to apply these methods as fully in the sphere of civil Government, but they urge strongly.

(a) That in all departments better provision should be made for inquiry research and reflection before policy is defined and put into operation.

(b) That for some purposes the necessary research and inquiry should be carried out or supervised by a Department of Government specially charged with this duties but working in the closest collaboration with the administrative Departments concerned with its activities.

(c) That special attention should be paid to the methods of recruiting the personnel to be employed upon such work; and

(d) That in all Departments the higher officials in charge of administration should have more time to devote to this portion of their duties.

Attention is drawn to the importance of the work achieved by the organization set up during the war under the Privy Council to encourage the application of science to industry, and the extension is foreshadowed of this form of organization to cover other fields of research, notably that of medicine, in which a fine record of achievement already stands to the credit of the Medical Research Committee.

DISTRIBUTION OF BUSINESS.

The Committee discuss at length the question of adopting a definite principle on which to distribute business between the various Departments. They say:—

There appear to be only two alternatives, which may be briefly described as distribution according to the persons or classes to be dealt with, and distribution according to the services to be performed. Under the former method each Minister will preside over a department would be responsible to Parliament for those activities of the Government which affect the sectional interests of particular classes of persons, and there might be, for example, a Ministry for Insured Persons, or a Ministry for the Unemployed. Now the inevitable outcome of this method of organization is a tendency of Lilliputian administration. It is impossible that the specialized service which each department has to render to the community can be of as high a standard when its work is at the same time limited to a particular class of persons, and extended to every variety of provision for them, as when the department concentrates itself on the provision of one particular service only, by whomsoever required, and looks beyond the interests of comparatively small classes.

The other method, and the one which we recommend for adoption, is that of defining the field of activity in the case of each department according to the particular service which it renders to the community as a whole. Thus a Ministry of Education would be concerned predominantly with the provision of education wherever, and by whomsoever, needed. This method cannot, of course, be applied with absolute rigidity. But, notwithstanding necessary qualifications, we think that much would be gained if the distribution of departmental duties were guided by a general principle, and we have come to the conclusion that distribution according to the nature of the service to be rendered to the community as a whole is the principle which is likely to lead to the minimum amount of confusion and overlapping.

The committee point out that in the case of services which are national in the sense (Navy, Army, Air Force, Post Office and in future, perhaps, always and after systems of transport), the efficiency of the service and the organisation of the personnel employed in it can only be secured by putting the responsibility both for the service and the persons in the hands of the same Minister as the head of the separate Department to which the enterprise as a whole is entrusted. The Report also lays stress on the fact that final and watertight divisions of business between Departments cannot be made under the complex conditions of modern government. The principal of assigning business to Departments according to the nature of the service which they exist to render must therefore be reinforced, and if necessary qualified by increased co-operation between Departments and greater readiness to recognise that the structure of Government is a living organism and must be expected to develop new needs as it grows and progresses.

DEPARTMENTAL CO-ORDINATION.

In dealing with the vexed question of Departmental competition for given pieces of work, the Committee illustrate their point of view by nothing that "work which is of primary interest to one Department may well be within the province of that Department, even when some portion of it is also undertaken as a secondary interest by Departments devoted to other ends. If, as we suggest, there should be one Ministry of Education, of Health, and of Finance, in which functions relating primarily to those ends should in each case be concentrated, there must at the same time be within other Ministries, special branches devoted to educational, hygienic, or financial work, as secondary interests of the Ministries within which they lie. Yet neither the Ministries of the primary interests nor the branches dealing with the secondary interests can operate with full effect unless they are in close and constant touch with each other. Sometimes this communication will need to be so close that there will have to be standing joint bodies of the Departments concerned. Sometimes regular or informal communication on specific questions will suffice. But contact of some kind is vital if the service in question is not to languish in Departments in which it is secondary, and if the Department in which it is primary is to exercise full potentiality for making whatever contribution lies its power to the general maintenance of the highest possible standard in all

branches of the work upon which its main forces are concentrated,

In the third place the Committee recommend that, in "the organization of individual Departments, special importance should be attached to securing proper consideration of proposals for expenditure, unimpaired Ministerial responsibility, co-operation with advisory bodies in matters which bring Departments into contact with the public, and the extended employment of qualified women." In the last point Sir George Murray dissents from his colleagues pointing out that the whole question of the employment of women in the service of the Government is now being investigated by other official bodies, and recording his view that any definite conclusions on the subject must meanwhile be premature.

Fourthly, the Committee, in concluding the first part of their Report, emphasize the danger that a more efficient public service may expose the State to the evils of bureaucracy, unless the reality of Parliamentary control is so enforced as to keep pace with any improvement in departmental methods." They allude in this connection to the importance of the recommendations of the recent Select Committee on National Expenditure, which aim at restoring and strengthening Parliamentary control over the country's finances and to an interesting suggestion that Parliament should maintain a continuous and informed survey of the activities of Departments by means of a series of Committees of members, each watching a particular branch of affairs.

DIVISIONS OF GOVERNMENT BUSINESS.

If the principle that the business of the various departments should be distributed as far as possible according to the class of service with which they are concerned be accepted, the Committee consider that the business of Government would fall into one or other of the following main divisions:—

- I.—Finance.
- II and III.—National Defence and External Affairs,
- IV.—Research and Information.
- V.—Production (including Agriculture, Forestry and Fisheries), Transport and Commerce.
- VI.—Employment.
- VII.—Supplies,
- VIII.—Education.
- IX.—Health.
- X.—Justice.

The Committee have considered whether the functions falling to the Board of Trade the Board of Agriculture and Fisheries, and, to a less extent, to several other departments can be best supervised by a single Ministry or by several Ministries all devoted in principle to the same end of increasing the productive capacity of private enterprise, and therefore associated with each other, whenever requisite, by some machinery of joint committees, though severally specializing in a distinct sphere. In the latter alternative separate Ministries might be responsible to Parliament for (a) commerce and industry; (b) agriculture and forestry; (c) fisheries; and possibly for other Government activities initiated by Parliament in relation to the matters mentioned.

Special interest attaches to chapters of the Second Part of the Report on Finance, Research, and Justice. In considering finance, the Committee recognize that the Treasury must remain the premier Department of State, and that responsibility for raising revenue cannot without peril be separated from control over expenditure. If the Chancellor of the Exchequer "is to be held responsible for filling the reservoir and maintaining a certain depth of water in it, he must also be in a position to regulate the outflow." But the Committee have substantial changes of spirit even more than of substance to recommend as regards the Treasury. They say:—

The information at our disposal suggests that if a new situation in this respect is to be brought about the obligation on spending departments to formulate a full and reasoned statement of their proposals must be recognized as placing on the Treasury a corresponding obligation not to assume a negative attitude in the first instance towards suggestions for improving the quality of a service of the efficiency of the staff which administers it.

RESEARCH AND INFORMING.

The influence of business men and methods on Departmental views and practice may perhaps be traced in the further recommendation that "in the Treasury there should be a separate branch specializing in "establishment" work, and studying all questions of staff recruitment, classification, &c., and routine business generally." The description of the varied activities, of Departments in conducting special inquiries and prosecuting research contained in the chapter on Research and Information furnishes ample proof both of the importance of these questions and the haphazard way in which they have for the most part been handled until now. The Committee definitely recommend the extension of the Privy Council organization to other fields of research. They also set out in some detail the kind of way in which they think that authorities solely devoted to research should share with administrative Departments the search for a solution of particular problems.

Much has been heard lately of proposals to set up a Ministry of Justice. The Committee devote considerable space to discussing the varied mass of duties which would have to be re-allocated under any such scheme, and formulate proposals to apportion the functions of the central Government in relation to Justice broadly between the Lord Chancellors Department and the Department of the Home Secretary. The Lord Chancellor would under such a scheme, be substantially relieved from the extreme pressure now falling upon him.

The Government, the Report concludes, have already anticipated the recommendation of the Committee in two important spheres of administration—namely, Government Supplies and Health. In each case the result of their decision will be to concentrate in the hands of single responsible Minister a number of essentially similar functions at present exercised by a variety of Departments. The gradual transformation of the Ministry of Munitions into a Ministry of Supplies was announced by Dr. Addison in the House of Commons on November 12. Five days earlier it had also fallen to him to introduce the Bill for the establishment of a Ministry of Health.

BOOKS IN BRIEF.

History of Education in Ancient India.

By N. N. Mazundar M. A. B. L. Macmillan & Co., Bombay, Price Rs. 1-8-0.

We have perused this book with great interest. It is written by way of protest against unfounded and ignorant charges against the ancient Hindus in regard to what Mr. Biss, I. E. S., who writes an appreciative preface, puts it as their "relation to the premature portion of the community." Hindu ideals and practices in regard to education are as difficult for a foreigner to understand as several other things Hindu and it is small wonder that an American writer has gone wrong about it. When we ourselves read this particular American writer—Dr. Graves of the Ohio State University—we set it down to his ignorance and nothing more. Systematic writers, however, who wish to give a compendious account of any subject ought to be careful of what they state in their productions. Imperfect generalizations are, of all kinds of generalizations, the very worst imaginable. In this particular case, Dr. Graves has to be thanked for his imperfect statement of a subject because it has been the cause of a good book being written on a subject on which there has been for long no authoritative book. Mr.

Mazundar has done his work well going to the original authorities as far as possible for his facts. We would commend the chapter on "General Characteristics" to any one who wants to have some idea of the fundamental concepts underlying Hindu Education. The chapter on "Universities" is a most interesting one and will repay perusal. The book ought to be studied by would-be teachers and by those interested in Indian Education generally. We would be glad to see it studied in our Normal and Training Colleges as well.

The year Book of the Ceylon Agricultural Society, 1919-1920.—Edited by C. Drieberg B.A., F.H.A.S., Secretary, Ceylon Agricultural Society. Times of Ceylon Co., Ltd., Colombo.

Mr. Drieberg and his staff deserve to be congratulated on the prompt manner in which they have issued the *Year Book* of the Ceylon Agricultural Society for 1919-1920. This edition is a great improvement on its predecessor, good as it was. Much fresh matter has been added, more especially to the section dealing with Crop Notes. We note that some of the more important leaflets of the Ceylon Agricultural Department have been reproduced in this volume. This is as it should be. The map of

Ceylon and the list of bulletins added at the end of the book enhance its value.

Industrial Gwalior.—By Alakh Dhari, Inspector-General of Commerce and Industry, Gwalior State. Alijat Darbar Press, Gwalior.

This book has been written with the express purpose of giving a clear account of the principal industries carried on in the Gwalior State. Incidentally the working of each industry during the past official year is given. Mr. Alakh Dhari prefaces his description of the industries by an excellent survey of the economic position of the Gwalior State. Education (including the idea of founding an University in Gwalior), agriculture mining, hydro-electric schemes, development of co-operation and large industries, utilization of forest products, improving the weaving industry, bettering communications and other kindred topics are all dealt with in a clear and perspicacious manner. There can little doubt that there is a general awakening in Gwalior as elsewhere in India in regard to economic development. Mr. Alakh Dhari is, we think, right in observing that before we attempt development work generally, it is necessary to have some idea on what lines this development work should proceed, what industries, for instance, should have precedence over others, and what should be the determining idea or ideas in regard to the construction of a well defined programme of work. The need for an economic survey of Gwalior State seems thus a necessity and it would be well to undertake this in the interests of sound development. It is, we think, almost a truism that such a survey as the one suggested is almost a necessity for every country that desires to make the most of its resources. But how few act it is needless to say. But the Gwalior State have proceeded far on the road to industrial development and they are in a position to initiate a survey on right lines. This being so, it seems necessary that they should attempt this without delay if the work they have already done is not to be lost. If Mr. Alakh Dhari's review of the present situation leads to such a survey, it will have served a very useful purpose indeed.

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SIR RABINDRANATH TAGORE'S VIEWS ON SOME EDUCATIONAL QUESTIONS.

BY V. SUBRAMANYA IYER, B.A.

IN continuation of the views published in the February issue of this *Journal* are laid before the reader the following which have been taken from Sir Rabindranath Tagore's subsequent conversations.

I. *A most fundamental need.*—It is an imperative necessity that India of the present, and especially her universities should, adequately realise her ancient sense of *equality*, which the narrowness of castes and creeds has during recent times almost stifled. This misfortune has to be partly traced to the exclusive cultivation of Sanskrit by the few. It is high time that the illiberal walls were pulled down, and equal chances afforded to every one in the land to secure the benefit of the intellectual and spiritual legacy which India's children have jointly inherited. The great thoughts in her *ancient Sanskrit* literature, if rightly understood and rightly interpreted, would be the most powerful antidote for the modern narrowness and exclusiveness which have contributed not a little to her sufferings. Sanskrit education should therefore be denied to none. It will help best to put into the hands of every one of India's sons and daughters, a vernacular *efficient* for the acquisition of a *higher culture* common to all India.

Again, if it is agreed that universal or national education is not possible except through the *vernaculars*, it is absolutely necessary to make them fit instruments for this purpose. That they serve best as media for instructing children in the lower stages is readily acknowledged. Whether as the languages of the masses, mostly illiterate, they could express highly abstract, scientific, technical and literary ideas has been a matter of grave doubt. In fact, their inherent deficiency in this respect has been patent from time immemorial, inasmuch as they have had to borrow words from Sanskrit to convey deeper and technical thoughts. And if from these tongues the Sanskritic element should be eliminated, there would be left in the great majority of them little to indicate real culture. If the Vernaculars, therefore, are to respond to the need either of the higher and the university stages of study, or of modern public life in India, whatever gives these languages the capacity to form abstract, scientific and literary terms should be strengthened. In other words, without a reinforcement of the Sanskrit element the vernaculars can never fulfil the higher functions of Education.

If they are not to depend on Sanskrit, they must beg of European languages for sustenance. Else they will die of inanition in the modern struggle for existence. Which then is the more practicable and the easier of accomplishment: either to cut off the Sanskritic source and to open in their stead new European channels; or to retain the Sanskritic element, to develop it and to

supplement it by borrowing not from the languages of Europe alone, but from those of all the world, whatever may be needed?

It is sometimes argued that Sanskrit is a 'Dead' language, and that as such it can infuse no life into the vernaculars: or rather, its influence would be retrogressive, and would unfit the people for the modern struggle. But 'dead' is an epithet which only means 'not current' and that in a particular form. The words of a language bring with them not merely sounds but also ideas. Who does not know that Sanskritic ideas imported by the Sanskrit words in the Vernacular are at the present moment influencing Indian life as deeply as the vernacular ones? And what is more, like the Greek and the other classical literatures of Europe, the Sanskrit culture contains many thoughts of value to the end of time: thoughts to which men not only of India but of the entire world would recur again and again, thoughts that can never be old and therefore much less 'dead.' 'Dead' as applied to a language like Sanskrit signifies, therefore, neither 'uselessness,' nor 'lifelessness.' And if the vernaculars are still 'living,' it is because they still continue to draw upon the Sanskritic source of vitality.

The need for frequent translations from one Indian language to another, not only for their common enrichment but also for the development of mutual intellectual sympathy is increasingly felt. Is any argument, then, required to show that with the common Sanskrit element developed, it would be easier to achieve this object than with the common features of the vernaculars suppressed or whittled down to the least possible dimensions.

Again, one of the serious problems demanding solution in this country is that of a common popular tongue, at least for all non-Urdu population. And this hope will be nearer realization only if a knowledge of the common Sanskrit element be spread

rapidly and wide: and not by any other means yet known.

One of the first steps to be taken therefore in the matter of Indian Educational reform is to make the *Elements* of Sanskrit a *Compulsory* subject of study for every non-Urdu pupil, wherever the advancement of the Indian vernacular is sought.

A frivolous objection.—That a simultaneous study of two or three such languages entails undesirable strain, upon the child is, to say the least, a thoughtless criticism. This argument would have some force if Sanskrit were a foreign tongue or if it were made a medium of instruction. At the present moment, in many parts of India, Sanskrit and the vernacular are actually being taught. In the past, the Lingayats of the south and the Jains, not to say anything of the Brahmins, all over India, studied Sanskrit and a vernacular. Most Urdu speaking Mahomedans learn, even now, not only Urdu and sometimes the local vernacular, but also Persian or Arabic. And in Europe, America and Japan children learn, in most schools, more than two languages one of which is often a foreign tongue. And yet the complaint of a 'strain' has not till now been heard. There may be a few subnormal minds that find it difficult to study more languages than one. And even for normal minds, the acquisition of languages, late in life, is really a difficult task. But to the average child the learning of languages, especially allied ones such as Sanskrit and those Indian vernaculars that have borrowed largely from it, can never be a strain. It is at bottom only a question of the method of teaching languages, at that stage. The book-method now so frequently employed is the very opposite of rational. At Bolpur not only Sanskrit but even English is taught without books. No *practical educationist* can contend that the study of Sanskrit at an early stage will tax the mind of average Indian children speaking the Indian vernaculars.

If the study of Sanskrit is dropped in our schools we cut ourselves off from our past completely and gradually westernize ourselves. And this would amount to our suicide.

The real advantage of the vernacular medium.—It is true that those who graduate in the vernacular have comparatively more limited prospects in modern life than their brethren, who acquire knowledge through English. But the fact should not be ignored that those who take the vernacular path can gain more knowledge in the same time. In Germany, for instance, the average boy of the High School stage knows more than his compeer in India. *The standard should, therefore, be raised when the vernacular medium is adopted.* And it will follow naturally that a vernacular graduate will command a higher market value than the English, whose general standard of attainments would be lower, in spite of his special knowledge of English. The vernacular men ought, in the interests of every government, to be preferred for public service. Men and women will then naturally seek in larger numbers, the vernacular courses, which will rapidly increase its popularity.

II. *Should men and women have different media of Instruction?* The answer is no. When the standard of the vernacular courses is raised and when their market value rises, this question will find a natural and an easy solution. Every woman must be at liberty to choose the course that suits her capacity.

III. *The Co-operative Idea.*—Too much emphasis cannot be laid on the great possibilities that the application of the principle of 'Co-operation' has in the educational world. For more reasons than one, India urgently needs its adoption. It is not merely the financial and the social aspects, but other considerations of a more directly educational nature that call for its introduction. Whether school-work should not have a

bearing upon the present, as well as upon the future environment of the child is not questioned. It is also admitted that the child must be made to draw inspiration from the social life outside the school-world. But it is more important that the life outside the school should contribute to life within, which can be done best by the children *co-operating* with the men in practical life. Let the pupil assist in cultivating the school lands, in building the school houses, in managing the school Banks and moneys, school shops, and boarding houses, in policing the school premises, and in maintaining school discipline. Nay, if the masons, carpenters and smiths of the neighbouring suburbs or villages work at the school house, let the children assist them, as far as may be, and learn. If the weavers supply clothing, let the pupils go unto them and learn their work also as far as may be. Let the children be made to see how the various trades, callings and professions contribute to the life of the school community and realize, that it is such co-operate effort that makes for the well-being of the larger community. There is much to be learnt from the Tuskegee Institution, the George Junior Republic and other educational organizations of America which have been turning to excellent account co-operative and civic principles. It must never be forgotten that true education consists in realizing at every step how our training and information have organic connection with our surroundings.

IV. *The revival of an old idea.*—To attain the very best results in Education, an amount of seclusion from the dust and din and distractions of city life, is desirable. An ideal institution should be situated a little way from the city but not away from human life. It must be surrounded by hamlets or suburbs of people engaged in various occupations who could be visited by the pupils, as often as practicable. The need for such retirement is felt particularly in the

case of High Schools, Colleges and Universities. This is an old Indian idea, which is now being largely adopted in the West.

• V. *Holidays and Excursions*.—Excursions may be made either to the city or to the country. The latter demands our special attention. They ought to be systematically arranged at every one of *the four seasons*, Spring, Autumn, Rains and Winter, when nature bears marks of perceptible change in her moods. Such days as are most characteristic of the seasons must be fixed and plans laid out for taking the children of *all* schools out. The teacher should create for the pupils interest graduated according to their standards. The higher the grade the more spiritual, the more poetic and the more scientific must be the interest.

It is very desirable that the adult population also should be encouraged to make holidays of this kind in *each of the seasons*. Special portions of the forests, wooded lands, and banks of rivers in the neighbourhood should be marked out for this purpose.

Hindus as well as Mahomedans have had such longings in them, but modern life is killing their love of communion with nature. The cultivation of the emotional side of man, weeding out the base passions, is far too much neglected so that we find ourselves more and more in the grip of materialism.

A factory for extracting oil from alum schist has been started in Sweden. Large quantities of this schist, yielding benzine and crude oils are found in the Lamma Nerika district. The crude oils, according to the *Teknisk Ukeblad* of August 30th, can be used for oil engines or converted into paraffin and lubricating oils. The factory is capable of treating 30,000 tons of schist per annum, giving 1,200 tons of oil. The supply of schist in Sweden is practically inexhaustible, and other factories will be erected shortly.

RECONSTRUCTION IN GREAT BRITAIN.

BY ARNOLD WRIGHT.

SLOWLY, very slowly the problems of reconstruction are being grappled with. Peace hath her difficulties not less formidable than those of war is an adaptation of an old adage which is daily forcing itself upon attention. On all sides troubles are developing which it will require strong statesmanship and exceptional foresight to dispose of satisfactorily. Never before, indeed, has the Government of this country been called upon for the display of a larger measure of these qualities. The demobilisation of seven million men implies a colossal effort in every branch of the administration and a corresponding disturbance and readjustment of the conditions of civil life. But with goodwill on the part of the community and the full exercise of the golden virtue of patience there is no reason to fear the ultimate outcome of the existing confusion. For one thing the economic position of the country and of the Empire is sound. In spite of the tremendous efforts that have been, the unprecedented expenditure of money and the equally unprecedented sacrifice of valuable lives the national credit and the national power to advance are unimpaired. The war has been a hard teacher but its lessons have been thoroughly acquired. In industry especially we have progressed enormously beyond the front at which we stood at the opening of the great war. Our scientists and inventors have worked to good purpose in almost every branch of production. New processes and improved equipment have revolutionised our systems of manufacture in many instances and it is not too much to claim that Great Britain to-day stands at the head of the great manufacturing nations of the world in all the vital elements of business. Until our war machinery has

been fully converted to meet the needs of peace the full effect of the revolution that has been worked will not be revealed. But the air is changed with the inspiration of a new hope which is pleasantly apparent amid the turmoil of Bolshevik anarchy.

The message of the New Era for India is one as hopeful and inspiring as that which it is conveying to the Empire's centre. The old order is changing giving place to the new. Industrial eminence is assuredly hers if she applies properly the teachings of the time and puts to full use her matchless resources. In steel manufacture, coal production, the working of leather, and a score of other important branches of activity she has an assured future if she rises to the greatness of her opportunities. That she will do so is hardly to be questioned. The enlightened enterprise which created the Bombay Cotton Manufactures and the great steel undertaking of the Tatas will find vent in new directions and result ultimately in a truly national industry second in importance to none in Asia. But if there is to be the rapid progress that all friends of India desire the educational system of the country will require to be brought more into harmony with modern needs. Technical schools will have to be multiplied, practical science given a more prominent place in the university curriculums, and more direct official aid must be given to nascent industries. At the same time there must be a change in the Indian attitude towards manual processes. It must be as great an object of ambition to be a skilled engineer or an efficient craftsman as to be a successful pleader or a well paid official. Young India like young Britain must equip itself with greater scientific efficiency for the new struggle upon which we are entering for commercial supremacy. The day is past when any country can be great by living in the past. The future belongs to those who can turn to the best account the resources of nature and unravel most effectively its still unrevealed secrets.

If I were asked to indicate the two principal directions in which development would proceed in the immediate future I should name aerial navigation and the manipulation of electrical energy. In both respects the coming years hold boundless possibilities. The science of aviation is yet in its infancy but we read in the current issues of the press of a non-stop journey of 6,000 miles of a Zeppelin airship and practical talk of services which will connect the uttermost ends of the earth by aeroplanes which will traverse the longest distance in a few days. The time is undoubtedly coming when India and England will be linked by a fast service of aeroplanes which will bring the two within the range of a forty-eight hours communication. Electrical development is still not so conspicuous, but there are plans in process of fruition which will effect a wonderful change in all the relations of life. The utilisation of water-power for the generation of energy, perhaps, offers the most brilliant prospects. While in most countries there are abundant facilities at present not availed of for hydro-electrical enterprise India presents an almost unique field for this type of work. In the South as well as in the North there are untold millions of gallons of water running to waste. The harnessing of this surplus power and its application to the needs of man is a problem which it will be easy to solve if the governing authorities render the necessary initial aid. Some day probably not far distant we shall see industrial India almost completely supplied with essential power for working its machinery from hydro-electrical installations posted at convenient centres for distribution from the Himalayas to Cape Comorin. Nor will it be necessary probably to rely entirely upon the rainfall for the means of creating energy. Scientific opinion is awakening to the possibilities of using sea water along the coasts for hydro-electrical work. In a recent number of the *Engineering Supplement* of the *Times* there appeared an elaborate article showing how tidal waters could be utilised for driving turbines. Along the Indian coasts both in the West and the East there are numerous points at which hydro-electrical apparatus could be installed on these lines. The subject is one of

tremendous importance and it should be some body's duty to investigate it as far as it affects India with a view to practical development for the benefit of infant industries.

Manufacturers in every important district are making their preparations to take advantage of the boom that is confidently expected in trade as soon as the Peace treaty is concluded. There are everywhere immense arrears awaiting attention and especially in that special department of industry which is concerned with railway equipment. Not merely in the war devastated areas of Europe are the demands great and insistent for new rolling stock but in almost every country of the world which before the war relied upon Europe for the satisfaction of its needs. I am told that some of the waggon manufacturing concerns in this country have orders in hand already which will keep their factories occupied fully and continuously for two or three years. Railway waggon construction before the war was largely engaged in by German firms, but there is little likelihood of their resuming operations for some considerable time to come owing to the lack of raw material and the disturbed conditions of the country. The United States, however, are likely to prove a formidable competition for trade with British firms. At the same time the demands to be satisfied are so vast that at present at all events the encounter gives rise to no anxiety. India has in recent years been a manufacturer of rolling stock for her own lines, and there seems no reason why she should not lay herself out for a share of the foreign trade. In Mesopotamia at all events there is a field which seems to be peculiarly adapted to her capacity. In that country there will be a very large demand for rolling stock for a long time to come and enlightened self interest seems to require that India should take steps to meet it. The Mesopotamian Railway system must in time be one of the most important in Asia. Looking not very far ahead we may see it linked up with the Indian system and constituting one of the great land routes from the West to the East. On all grounds it is desirable that the connection formed with the construction of the system in war should not be broken now that peace is here. In a real sense Mesopotamia is a permanent sphere of influence of India.

THE DEVELOPMENT OF AGRICULTURAL ORGANIZATION.*

BY SIR R. HENRY REW, K.C.B.,

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THE advantages which farmers would gain by combination for their mutual interests have long been recognised in theory but very imperfectly realised in practice. For certain purposes, indeed, farmers have long shown, some readiness to combine. There are hundred of societies and clubs throughout the country many of them of considerable antiquity which exist mainly for the improvement of farm stock. No doubt many of them are supported by large landowners and others interested in Agriculture, but they nevertheless include a large proportion of tenant farmers, who have associated themselves together for practical objects. Combination of farmers for their general interests as a class has also had partial success, in the Central Chamber of Agriculture and the Farmers' Union. But it, nevertheless remains true that the farmers are reluctant to combine, and that if for a time they are induced to do so they are apt very quickly to fall away. Under the influence of persuasive eloquence, or the stimulus of some political grievance, they may join an association, but when the second or third subscription falls due they begin to ask what they are getting for their money—a question to which a very definite answer is not always immediately obvious. Altruism is not a characteristic virtue of any class of Englishmen, and it is perhaps especially inconspicuous among farmers. The British Farmer is very practical person, with a

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strong tendency to individualism and a rooted objection to unremunerative outlay.

- It is now about a quarter of a century, after some experience of agricultural organization in different phases, I became convinced that a national Association of Farmers on a scale commensurate with their numbers as a class, and their importance in the country, was only feasible if direct commercial objections could be combined with more indirect political and economic objects, to which attempts at establishing such associations had generally been restricted. The really powerful class organizations in this country are those which offer pecuniary advantages to their members, as well as the more impersonal benefits to be attained, by joint action in the interests of their class. I used such influence as I then had with the Chambers of Agriculture to induce them to take up the question from this point of view. Two committees explored the subject in considerable detail, and the report which was presented in 1898 on Co-operation for the Sale of Agricultural Produce attempted to sum up the position as it then appeared and recommended the establishment of a "Co-operation Section" of the Central Chamber of Agriculture. That Proposal was supported by many of those who at that time were among the most farsighted leaders of Agricultural opinion, and, if it had been possible to develop it, the initial difficulty of enlisting the aid of the larger farmers in promoting the principles of Agriculture Co-operation might possibly have been overcome, and the whole movement might, perhaps, have been accelerated. The organization of the Chambers of Agriculture then, as now, comprised a large number of local bodies, which varied a good deal in the scope of their operations, and some of them, at that time had adopted the principle of co-operation in one form or other—usually for the purchase of farming requisites. It appeared that by the process of building up on existing foundations the adoption of the

principle might be gradually extended throughout the country with the assistance and support of those who were recognized as the leaders of the Agricultural Community. There were obvious objections and difficulties attaching to this mode of procedure, and it may be that the establishment of a new and independent association was the better course. A year or two after, the late Sir R. Yerburch, who was a member of the Committee of the Chamber of Agriculture and approved its Report, and established the Agricultural organization society which has now become a powerful and widespread association. The position which it has now attained and the work it is doing, are indicated by Mr. Leslie Scott and Mr. Acland in the papers which appear in this number of the Journal. It may be noted that the initial difficulty referred to above still remains, although, thanks largely to Mr. Scott's own energy and enthusiasm, the interest and assistance of larger farmers are now being rapidly enlisted in the movement.

In numbers what may be termed large farmers are more limited than is sometimes realised. There are 51,767 holdings of more than 158 acres in England and Wales, of which no more than 14,126 exceed 300 acres. But the influence of these farmers is not to be measured by their numbers. Each of them is in a large degree an example which those who occupy smaller farms attempt to imitate, for the tendency of even the small holders to copy the methods and practice of the larger farmers in the District—sometimes quite unsuitably and unwisely—has often been remarked. No doubt it is difficult to bring the large farmer and the small holder on to the same commercial plane, but the problem though difficult, is not insoluble, and if farmers themselves assist there is good reason to believe that the Agricultural Organization Society can and will, solve it.

The principles stated in the Report to which reference has already been made, are generally accepted. While co-operative purchase of farming requisites is easy, co-operation for the sale of produce is very difficult. The advantage of association of producers in particular districts for the joint disposal of certain classes of produce is particularly marked in the case of farm produce subjected to a process of manufacture such as the conversion of milk into butter or cheese, the curing of bacon, or the making of jam. Co-operation for the sale of live stock and for the sale of milk had, twenty years and more ago, been undertaken with success. The tendency, both at home and abroad, for Co-operative Association it is specialised—that is to confine their operations to a particular kind of produce appears to continue, and probably affords the best if not the only, means, in most cases, of getting the co-operative principle accepted in a district, leaving the linking up of specialised societies to a latter stage of development.

It is a platitude that British Agriculture, with the British nation, and indeed the whole world, is entering a new era, of which all that can at present be said, with certainty, is that the conditions will be different from any which have previously existed. Whatever the future may bring, however, it is clear that farmers will find combination not less necessary than before, and that in developing that form of it which is commonly known as co-operation, they will be wise in their day and generation.

It is announced for general information that for the present licenses will be freely granted for the export of all oilseeds and vegetable oils, except to certain destinations in Europe. Full particulars may be obtained from the Collectors of Customs at the various ports.

LAC CULTIVATION IN MYSORE.

BY RAO SAHEB M. RAMA RAO,

Special Forest Officer, Mysore State.

LAC cultivation is carried on in Mysore for over half a century. The first mention of it is found in the Forest Annual Report for 1866-67. From the year up till 1892-93, areas containing *Jalari* trees (*Shorea Talura*), the only species on which lac is cultivated in the State, were farmed out to private contractors. From the latter year up till 1916-17, it appears to have been partly cultivated by the Forest Department and partly by private lessees. Since 1916-17, all the lac producing *Jalari* areas have been leased out. The cultivation is carried on in the Mysore, Bangalore, Kolar, Tumkur and Hassan Districts. Some attempts seem to have been made to introduce it in the Shimoga and Kadur Districts in the later nineties, but were not persisted in probably due to unsatisfactory yield of lac.

Information available on the annual quantity produced and revenue realised is very meagre and fragmentary. The yield of Departmental cultivation is recorded but that of private lessees finds no place in the reports. 965 local maunds (28 lbs. each) equivalent to 12 tons of lac was the highest recorded yield in 1901-02. The highest revenue realised was Rs. 8,323 in 1906-07. It has gradually fallen ever since to Rs. 814 in 1916-17.

The Trade returns of 1913-14, 1915-16 and 1916-17 show that 900, 951 and 1,011 maunds of lac were exported, while the imports were 300, 411 and 384 maunds respectively. Assuming the imports to represent local consumption and exports to represent local production, the annual output may be taken at 1,000 maunds.

The price of lac during the same period was well above Rs. 21 per Bengal maund

or Rs. 7 per local maund, except during 1915-16, in which it fell to about half of the above figure. These figures do not explain the fall in revenue to Government during recent years.

There is no reliable account of annual consumption of lac within the State, though there is reason to believe that an appreciable quantity is used by Goldsmiths, Copper and Brass-smiths, by Native Physicians, Baugle-makers, for sealing-wax, etc. As already stated, we may roughly assume the quantity imported annually to represent the local consumption.

There is no detailed record of all the Jalari areas available in the State, the areas that are at present utilised for lac cultivation and those hitherto unutilised but suitable for the purpose. Such information has to be collected in all the Districts and permanently recorded, and the existing Jalari areas indicated on Taluk, and Village and Forest Range maps. There is no doubt that there are large patches of Jalari jungles which have not been hitherto used for lac cultivation, as some instances of which may be cited. Jalari tracts in Chamaraajanagar, Berambadi, Ainur-Marigudi, Kakankote and Mettikuppe forests of Mysore District; District Jungles round about Narasimharajpura, Kusgal, and Mudigere Forests in the Kadur District and some forests of the Nagar Taluk of Shimoga District. In Jalari tracts of heavy rainfall, the lac-insect may not thrive at first, but when gradually introduced and acclimated, it is likely to thrive and produce lac there just as well as in the maidan tracts.

The present method of cultivating lac on the Jalari tree in the State is more or less similar to the cultivation of *Kusam* and *Palas* lac in the Central Provinces. A description of the latter method is given in Mr. Avasia's printed note on "Lac and Lac Cultivation," and Mr. Lowrie's note on "Propagation and Collection of Lac." The following is a brief account of it.

The trees to be infected are first selected, very old and stunted trees being rejected and vigorous ones with healthy branchlets being marked for infection. Trees growing close together in a dense mass are also avoided, as lac-insects do not thrive on them for want of free play of air and light. All dead branches and branchlets on trees selected are removed. In the case of trees with few young branchlets, or in which the branches are stunted and moribund, such branches are lopped or pollarded at least one year before the propagating season, to encourage the growth of sappy shoots. At the forks of branches four to six feet below the young shoots, small bundles of mature encrusted sticks in which the young larvæ of the lac insect are about to crawl out of their shells, are tied. This is called the 'brood-lac.' A bundle may contain four to eight or twelve sticks depending upon the size of the lac incrustation. The number of bundles tied on to each tree depends upon the size of its crown, the larger the crown the greater is the number of bundles used. They are generally tied on the branches on the windward side of the crown, so that insects blown by wind may be caught up by the leafage of the crown and crawl on to branchlets instead of being blown off the tree and killed. The young insects crawl up branches for a length of even ten feet to get the young branchlets.

After the sticks are tied, the insects emerge out of their resinous shells and crawl up to the young branchlets and fix themselves on the sappy bark and suck the sap. This crawling out or "swarming" as it is called, may last from fifteen days to a month, at the end of which the original resinous incrustation will become empty of all young insects.

The insects remain stationary on the branchlets and make a thin shell round themselves by a red resinous fluid which they secrete. This shell gradually thickens by further secretions of the insect and

becomes the lac incrustation. When the male insects mature about two months after infection, they crawl out of their shells to those of the females and impregnate the latter and then die out. The females remain in their shells, increase in size losing their legs, and become rounded sacks. When the eggs mature and young larvæ are formed, these latter swarm out of the mother insect, which then dies. The life of the insect from the first infection to the "swarming" out of the next generation is about six months. Just about the time the swarming begins, the incrustated branchlets are cut and about a fourth of the quantity is employed as brood-lac for the next crop.

If the crop is poor owing to adverse causes such as drought, fires, heavy rains, attacks of predacious vermin, the incrustated branchlets are left uncut, so that the young insects in them may spread out to fresh branches and form a good crop for the next harvest. The foregoing adverse causes sometimes ruin the entire crop, thereby causing not only heavy loss but also necessitating of brood-lac from elsewhere for cultivating the next crop.

The cutting of the incrustated branchlets in harvesting the crop serves as a pruning for the trees which put on fresh shoots for the raising of the next crop.

The bundles of incrustated sticks used as brood-lac are collected together after all the young insects crawl out of their incrustations. They form the 'stick-lac' of commerce but are not generally sold as such. The sticks are taken home and the resinous incrustations removed and dried thoroughly in shade after removing pieces of wood, bark or other foreign matter, and then sold.

Two crops of lac are raised annually one in May—June and the other in November—December. The seasons may vary by about a month by climatic changes which retard or quicken the 'swarming' period. The time of harvesting of a crop is also the time for the sowing of the next crop, since

the harvested incrustation is used as the brood for the next crop.

This is said to depend upon the quantity of brood-lac used, the number of vigorous and healthy branchlets in a tree, the size of the crown of the tree, climatic conditions, and the immunity or otherwise of the incrustations from the enemies of the insect, etc. An experienced old Vaddar who was employed in lac cultivation for over thirty years in Melkote Forests informed the writer that a yield of *four* times the quantity of brood-lac used is a good crop. The average yield in Bangalore District is stated to be about five seers of twenty-four tolas per tree or about 3 lbs. The average yield of Palas lac (Muttuga) in Central Provinces is about the same.

From the writer's observations of the operations of lessees in the Narayanadurga Forest of the Mysore District, and Kariyappanahalli and Puttenahalli District Jungles in the Bangalore District, he is of opinion that the lessees do not take as much interest in improving the methods of cultivation as they ought to. The trees are not pruned sufficiently early to produce strong and healthy shoots before infection; the brood used for propagation is not carefully selected from the healthiest and largest incrustated branchlets, nor is the quantity used always adequate. Not infrequently, the infection is started late, when some of the young insects have crawled out and died. The pruning is done with blunt knives resulting in the bark being torn away from the wood, thereby preventing or retarding the growth of vigorous shoots. The cultivated trees are not constantly watched and the crop freed from squirrels, ants, and other vermins that damage the incrustations and the lac-insects. They employ inadequate and ill-paid staff who take little or no interest in their work. The lessees are men of small means and live far away from their lac farms. They do not seem to adhere rigidly to any regular rotation in selecting areas for cultivating

each year's crop so as to give sufficient rest for the tree and time to produce healthy shoots for the next crop. They do not take sufficient trouble to clean the crude lac of impurities and to convert it into 'grain lac' before placing it in the market, and consequently they get low prices for their produce.

SUGGESTIONS FOR EXTENSION OF PRODUCTION.

As already stated, there are no reliable figures of the annual production of lac in the State. Judging from the highest yield recorded in 1901-1902, and from the exports of three recent years, it is assumed to be about 1,000 maunds. This annual yield of 1,000 maunds is very poor and highly incommensurate with our vast resources of lac-producing indigenous trees. We have not only the Jalari trees occurring in greater abundance than is now utilised for lac cultivation, but we have also tons of thousands of *Sagade* trees (*Kusam* of Central Provinces), *Muttuga* (*Palas* of Central India), *Chatte* (*Ghont* of Central Provinces) and *Kari-Jali* (*Khiker* of Sindh) occurring in various parts of the State and capable of producing much larger quantities and finer qualities of lac than that of Jalari.

Experimental cultivation of lac on some *Sagade* trees in the Lakkavalli Range in the beginning of 1918 from brood obtained from the Central Provinces having resulted in fair success, the resulting brood was again used in June 1918, for propagation on new trees and a second brood was harvested towards the end of last December, and this has again been used to propagate a third crop of locally raised *Kusam* lac. Although the quantity of new lac collected at each harvest was small owing partly to preventable causes such as attack of squirrels and black-ants, and lac of careful and constant watch over the infected trees and partly to the new environments of the brood-lac, yet the results show the probability of commercial success

by persistent efforts and well organized and efficient conduct of the propagation operations. In size and colour, the lac incrustations of both crops locally raised compared quite favourably with the incrustations of brood-lac received from the Central Provinces. From the first-harvested crude lac, excellent dye and sealing-wax were prepared in the Central College by Professor Srinivasa Rao. The writer picked up an appreciable quantity of pieces of lac under the infected trees six months after the harvest had been made by the local Range Officer, the pieces having dropped down by the damage caused by squirrels before the first harvest. In some cases, wild fire had swept over the ground under infected trees and melted the fallen lac which had stuck to fallen sticks and grass and appeared like globules of amber. The lac-insect is very susceptible to serious injury by fires, and hence the mention of the above incident.

The above facts point to the possibility of extending lac cultivation in the State by :—

- (a) Taking up larger *Jalari* areas for the purpose;
- (b) Introducing its propagation on *Sagade* trees (*Schleichera trijuga*), which occur largely in the high deciduous forests of Mysore, Kadur and Shimoga Districts;
- (c) *Muttuga* trees (*Butea frondosa*) found in malnad and maidan Districts;
- (d) *Chotte* or *Chatte* (*Zizyphus xylopyrus*) trees found in all Districts, both in scrub and high deciduous forests. Regarding this tree, Mr. W. A. Fraymouth, Managing Director of the Esociet Co., Maihar, says that it is the best species for producing lac in certain parts of Central India chiefly Central Provinces, that the colour of the lac is good,

that the trees require no extensive pruning and that the cultivation is easy.

- (c) *Kari-Jali* (*Acacia arabica*) found in large masses in certain tank beds in many maidan and malnad taluks, particularly in Chitaldrug District; and
- (f) Other indigenous species such as *Elachi* or *Borai* (*Zizyphus Jujuba*), *Arali* (*Ficus religiosa*), *Atti* (*Ficus glomerata*), *Ala* (*Ficus bengalensis*), all of which occur more sparsely and isolated than the foregoing five species.

On the first three species lac is propagated extensively in Central India, and on the last in Sindh. The average annual figures of export of lac produced chiefly on *Sagade* and *Muttuga* trees in Central Provinces during 1904 to 1907 were 67,238 cwts. (3361.9 tons.) valued at Rs. 33,18,687. In Sindh, large quantities of very good lac are produced on *Kari-jali* trees every year. In 1907 revenue realized in one Division alone by leasing out the lac-producing areas was Rs. 85,000.

With these facts before us and with the result of the experimental cultivation of *Sagade* referred to above, and the successful formation of lac incrustations on a *Muttuga* tree in the Bangalore Jail compound by Jalari brood-lac experimented with last year by the Director of Agriculture, there is every reason to believe that by persistent efforts lac-cultivation can be so extended as to form an important industry yielding very handsome revenue to the State and income to the people.

For the introduction of lac cultivation on the above mentioned species other than Jalari, it is necessary for Government to take the initiative by starting experimental cultivation under the control and supervision of an earnest and enthusiastic officer from brood-lac obtained from North India; the

locally raised brood therefrom should be used successively generation after generation until the lac insect is well established and acclimated to the varying climatic conditions in which the several kinds of trees are found. After thus establishing its successful cultivation the industry should be gradually left in the hands of willing and enterprising ryots of neighbouring villages. Excepting the cost of brood-lac, the propagation of lac is a simple and comparatively inexpensive one, quite within the means of our ordinary ryots. For the first few years, they may need help in the supply of brood-lac, and advice in the methods of propagation, harvesting, working up of the crude-lac into "Grain-lac", and its disposal. When once they realise its simplicity and profitability, they may be depended upon to take to and continue the cultivation quite eagerly as do the ryots of some of the Central Indian tracts where lac is propagated.

When the quantity of lac produced is sufficiently large in the country, one or more central factories for refining it and converting it into shellac and for manufacturing lac-dye if there is a market for it, will come into existence.

What is wanted is earnestness, enthusiasm and great patience and persistent efforts in introducing the cultivation on the several species of trees named above and to continue the experiments, without being damped by any failures or by partial successes at first, until the industry becomes well established. Repeated experimental cultivation for *four* or *five* years during which two crops annually can be obtained, will be sufficient to establish the industry successfully or to prove that it has no chance of success. In the writer's opinion, the industry is bound to succeed, as all the conditions favourable for its successful establishment exist in the State.

For successful introduction of lac propagation on new kinds of trees, and for

increasing the output of the indigenous Jalari-lac, the following measures should be adopted:—

1. All *Jalari* groves in the State should be explored, their limits and their areas defined and marked on maps.
2. A period of rotation, say three years, should be rigidly enforced. A grove cultivated with lac in one year should be allowed three years' rest before being infected again. To ensure this, *Jalari* tracts should be divided into regular blocks and each block operated on systematically once in three years.
3. The trees to be infected should be cleared of all dead branches and branchlets, and stunted and stag-headed branches should be pruned with sharp knives. This should be done simultaneously with, or immediately after harvesting the lac crop, to enable healthy branchlets to be produced for the next rotation. This systematic pruning is essential for production of healthy brood-lac.
4. Brood-lac twigs should be selected and cut from large sized and healthy incrustations in time to prevent loss of insects by swarming out and dying before infection.

If the resinous lac is the sole object of the cultivation and not the lac dye also, the utilization of all the harvested lac twigs for brood-lac of the next crop, and the collection of the twigs after the insects swarm out is advocated by Mr. Fraymouth, as the lac on the twigs would then be almost free from coloring matter and organic impurities of the lac insect

and other predatory insects which will have disappeared by exposure on the trees. This is said to effect much saving of expense in getting rid of the coloring matter and organic impurities and to fetch a much higher price for the lac.

5. Infected trees should be protected against monkeys, squirrels, ants, larvæ of predaceous insects, especially *Eublemma amabalís*, and other causes of injury such as fires and thefts of lac-twigs. The first two may be trapped, or scared away by bamboo rattles. Ants are said to be kept out by applying a thick solution of ground yellow arsenic (Haridala), mollasses and water round the infected trees, and Mr. Fraymouth advocates a band of tar round the trees. No direct means of destroying the larvæ *Eublemma* appears to have yet been found out. Mr. Troup recommends harvesting of lac twigs from trees before swarming and tying them in bundles directly to the trees to be infected and removal of the bundles immediately the swarming is completed, so that the emergence of the predaceous moths, which generally takes place some time after swarming, may not occur on the infected trees; this saves the young crop of insect from the larvæ of the moths which will have no opportunity to lay their eggs in them. The lac removed must be immediately taken away and dried by fumigation with Carbon Disulphide or converted into grain-lac, so that the predaceous larvæ in it may be destroyed before the moths

- are formed. Fires should be prevented by regular fire-protection operations. Thefts can only be prevented by constant watching of the infected trees for about a month at the commencement until the brood-lac bundles are removed after swarming and for about two months before harvesting the new crop.

CULTIVATION ON SAGADE, MUTTUGA, CHOTTE AND KARI-JALI TREES.

6. As suggested for Jalari groves, the areas on which each of these species occurs in groves or large patches should be ascertained, defined on the ground, and correctly indicated on Taluk, Village and Range maps. They should be divided into annual blocks of three or a multiple of three in each locality, so as to admit of lac-infection on a rotation of three years to start with, until the most suitable period of rotation is ascertained by actual experience.
7. In selecting trees for infection, young saplings should be avoided. The branches of trees selected should be pruned so as to get their crowns rounded and to produce the largest number of healthy and sappy shoots. Mr. Lowrie of Central Provinces advocates this in his note, especially in the case of Sagade, for the reason that "by so doing, the maximum of incrustations is obtained for the size of the tree."
8. Lac cultivation on these trees being unknown in the State, no contractors or ryots will take to it until it is started and demonstrated, by experimental cultivation, to be profitable. This has to be done by the Forest Department which commands the requisite facilities.
9. The areas selected for the experiments should as far as possible be similar in climatic conditions to those where lac is now produced in Central India on those kinds of trees. In the writer's opinion, forests near Lakkavalli in Kadur, and Veeranahosahalli and Mettikuppe forests in Mysore district possess the requisite conditions for starting the experiments on *Sagade*, *Muttuga* and *Chotte* trees. For experiments on *Kari-Jali*, a dry locality where that tree occurs in groves, may be tried.
10. An earnest and enthusiastic trained Forest Officer possessing practical knowledge of the methods of raising Jalari-lac in the State should be put in charge of the work, under the control of the District Forest Officers. He should be given a small staff to conduct the operations and to carry out the experiments efficiently.
11. It being a well recognised fact in the Central Provinces that lac infection in forests not previously cultivated with lac is very uncertain for the first two years, failure, or poor crop in the earlier stages of our experiments, should not be allowed to discourage the attempt. The cultivation should be persisted in, all possible care being taken in previously pruning the trees, in selecting healthy brood-lac and applying it in the

proper time, in protecting the infected trees against its numerous enemies and in watching the crop constantly.

12. The experiments should be continued for four or five years the brood-lac being first obtained from Central and Northern India, and subsequent experiments being made with the brood raised locally therefrom in successive crops—until the lac insects on the several species get acclimated to our local conditions and become well established. As already stated we have raised two generations of brood-lac locally on Sagade from the stock obtained from Raipur in the Central Provinces and the third generation is expected to mature in June next. The yield was poor owing to several causes, some of which preventable, but that should not lead to the abandonment of the experiment, or to the premature publication of a dishartening account of it, as has been unwittingly done already.
13. If the experimental cultivation proves a success, of which there is no reason to doubt, then regular cultivation on a commercial basis may be left to local private agency, the areas to be cultivated by each person being specifically defined. Every encouragement and facility should be given to such persons at first by supplying them brood-lac at a low cost fixing Government share of lac or royalty low for the first few years and gradually raising it to the normal rate with reference to the quantity of lac

produced or number of trees operated on.

14. The lac areas should be given out on long-term leases so as to ensure the cultivators taking abiding interest in the industry.
15. Frequent inspections and supervision of all lac farms in the State by a Government Officer who has acquired expert knowledge of lac cultivation by a course of practical training in Central India at Maihar and Pusa and by conducting the experimental work in the State, should be provided for, free of charge to the cultivators.
16. The Government may also help the cultivators to secure a fair price for their produce by buying up the crude lac annually at the ruling market rates and refining it in a Central Factory of its own, before disposing of the refined article at a profit. Should there be a demand for lac-dye, it may also be prepared in a Factory. The cost of establishing a factory for preparing lac dye and refined lac or shellac is not likely to be heavy, as the machinery required could be easily made in the Industrial workshop or procured in India at a modest cost.

AGRICULTURE IN THE UNITED PROVINCES, 1917-18.

BY "RUSTICUS."

Mr. Hailey, the Director of Agriculture in the United Provinces, can always be depended on for an interesting report on the work of his Department, in which the facts are stated fully and frankly and are not coloured by any personal predilections on the part of the writer. The Agricultural Department in the United Provinces has suffered very severely during the last four years owing to the claims of the war on its superior staff but, none the less, much sound work has been done and, now that the war is over, rapid progress may be expected. It is evident from the Local Government's review of the Report which is far from being what such reviews so often are, a bald summary of the salient points of the Report, that it is fully alive to the importance of agricultural development and that Mr. Hailey will have a first claim on such funds as may be available. A very considerable expansion of the staff of fieldmen and of that of farms has already been arranged and more money will be allotted for this object as soon as possible, the ultimate aim being to provide a farm for every *tahsil* in the Province. The principal object of these farms is to be the dissemination of the knowledge and practice of improved methods of agriculture but they will also be used to test the suitability of new varieties to the conditions of the districts. Although this increase in farms is in prospect, it is clear from the fact that demonstrations of various kinds were carried out in 989 villages of the Central Circle and some 2,000 were given in the Eastern Circle that the Agricultural Department in the United Provinces has not lost sight of the effectiveness of demonstration on cultivators' own land. As we have

frequently pointed out in these columns, for one intelligent cultivator who is willing to adopt methods which have proved successful on Government farms, there are ten who decline to be convinced of the superiority of those methods until they see them carried out, not on their own land but on that of their neighbours. They are apt to be suspicious of work on Government farms and to think, quite wrongly, that considerations of expense are never heeded and that, therefore, such work has no bearing on their own conditions.

The three crops on which most work has been done in the United Provinces are wheat, sugar-cane and cotton. The Agricultural Department is now, however, devoting more attention to rice, millets and gram. The Local Government emphasizes the importance of improving the yield and the quality of the two latter crops, in view of the important part they play in the diet of the bulk of the people. Comparatively little work has been done on them anywhere in India so that the United Provinces are not specially backward in this respect. Two Pusa varieties of gram, Nos. 17 and 18, are now giving satisfactory results and there is a demand for the seed of selected varieties of *juar* (*jola and bajra kumbu*) with which the unfavourable seasons for these crops of late years in the Provinces have rendered it difficult to comply.

It is interesting to find that the Agricultural Department has been almost too successful with sugar-cane. The crops of the medium sized varieties it has introduced, J 33, Mauritius and Uba, were so heavy—twenty to twenty-five tons per acre being obtained in some cases against the usual average of eight to ten tons—that considerable difficulty was experienced in disposing of them with the existing crushing appliances. This is evidently a matter in which agricultural and industrial development must go hand in hand, and if the heavy yields have come to stay, as there is no reason to doubt, there

is every prospect of success in the United Provinces for factories equipped with modern crushing plant. It is a field to which Indian capitalists might well turn their attention.

The Pusa Wheats Nos. 4 and 12, and the Cawnpore variety C 13 continue to spread in the United Provinces and some 35,000 maunds of seed of these varieties were issued in the Central and Eastern Circles. Mr. Hailey estimates the difference in yield between them and the ordinary varieties, when grown under the same conditions, at three to four maunds an acre, so that the introduction of the new varieties has made no small addition to the food resources of the Provinces. The Department is now endeavouring to find a wheat better suited than the Pusa wheats to tracts in which labour is scarce and a beardless wheat is much subject to the depredations of birds. Mr. Leake, the Economic Botanist, has made some progress in this direction but the type he has isolated has not the same immunity from rust as the Pusa wheats.

In the case of both wheat and sugar-cane, Mr. Hailey considers that even more is to be expected, in regard to increased yields, from improvements in cultivation than from the introduction of improved varieties. The mere replacement of ordinary wheat or sugar-cane by a better variety is not sufficient unless it is accompanied by more intensive cultivation, particularly the better opening up and cleaning of the soil. If the importance of good cultivation is not realized, an unwarranted disappointment is sometimes felt at the outturns of the new varieties being smaller than was expected.

The year was an extremely bad one for cotton owing to abnormally heavy rain in September. This was specially unfortunate as it deprived the Indian Cotton Committee, which visited the Provinces towards the end of 1917, of much valuable material. No tests could, for example, be made of the hybrid

varieties. Mr. Leake has evolved at Cawnpore. Such results as were obtained were encouraging from the point of view of those who wish to see more long staple cotton grown in India. The American cotton crop yielded rather better than the indigenous varieties, whilst, for the first time on record, the price obtained for it was *much* better, a premium of Rs. 4 per maund of unginned cotton being obtained. There was, however, a certain element of artificiality about this price, for the whole crop was purchased by the Agricultural Department and, after ginning and pressing, was sold by it on the open market. Obviously this system can only continue as long as the crop continues a small one and, if it increases, some other method of dealing with it will have to be found. The Local Government suggests that Co-operative Societies should take over the work. A beginning has been made in that direction in the Punjab and Bombay but co-operative sale of produce demands qualities of a somewhat different order from those involved in the successful supply of credit. That, however, is a subject which is beyond the scope of this article.

One interesting reaction of the war on the agriculture of the United Provinces was the extension of the area under castor, the oil of which was in demand as a lubricant for aeroplanes. The rotation experiments are worthy of mention. They are specially important owing to the large area in the Provinces which is cropped twice in the year and the necessity of growing a fodder crop in the thickly populated districts. It has now been established that a fodder crop of *juar* (*jola*) can be successfully followed by a quick growing wheat, provided the first crop is properly manured and the land is cultivated with an iron plough and harrowed. The value of manure is also strikingly demonstrated by the large yields of wheat—25 to 30 maunds an acre which have been obtained on the farms in the Eastern Circle after maize in the same year where

the maize has been sufficiently manured. These experiments entirely corroborate Mr. Hailey's contention that improvements in agricultural practice are an even more important factor in securing increased outturn than improved varieties.

The interest taken by the Talukdars of Oudh in agricultural development which has led to the establishment of numerous private farms has been mentioned in our previous reviews of Mr. Hailey's Reports. This interest is now extending to land improvement. On one large estate, the installation of a pumping plant and the construction of the necessary masonry channels is transforming several thousand acres of sandy waste into good culturable land. On two other estates, land hitherto unculturable owing to the efflorescence of alkaline salts, *usar* land as it is called in the north of India, is being reclaimed.

The Agricultural College had a successful year. It has now as many students as it can conveniently hold and is beginning to find itself cramped for laboratory room. The two years' vernacular course is becoming increasingly popular. As the teaching of practical agriculture is the main feature of this course, this is satisfactory as it evinces a genuine demand for agricultural education for its own sake and not as an avenue to Government service. That is hardly the case with the diploma course, for of the nine students who formed the first batch to pass out, no less than seven obtained employment under Government either in the Agricultural or the Education Department. The recent discussions in regard to agricultural education in this country have at last borne some fruit and a middle school for agriculture will shortly be opened in the United Provinces for boys of 15 to 17. It is intended mainly for the sons of the smaller landholders and the larger tenants with occupancy rights who will have land of their own on which to practice what they learn at school. The experiment will be watched with interest.

THE CULTIVATION OF SISAL HEMP IN MYSORE.*

BY A. CHATTERTON, B. SC.,

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IN this note which is specially written for the people of Mysore, it is hardly necessary to point out that aloes of various species in most parts of the State grow luxuriantly and are largely planted to form hedges. From the leaves of these aloes fibre is extracted and used locally for the manufacture of ropes and twine. The fibre is not easy to extract as the leaves yield an acrid juice and the separation of the fibre from the pulp is a tedious operation. The industry, if it can be so called, is a purely domestic one carried on merely to supply local needs. There are machines which will easily extract the fibre; but they are costly and require a large amount of power to drive them. They are hopelessly beyond the reach of the cultivators. Further, it is an unfortunate fact that, although aloes are extremely plentiful in Mysore, the species which have been introduced are those which yield but a small percentage of a weak fibre which has a comparatively small commercial value.

There is, however, one species of aloe, the botanical name of which is *Agave rigida* var *Sisalana*, which is very largely cultivated for fibre in Yucatan, the Bahamas, Florida, what was formerly German East Africa and, to a very limited extent, in some parts of India. This aloe yields a very valuable fibre which is in great demand for the manufacture of binder twine, of which enormous quantities are employed in America every harvest. It was introduced into Mysore by the late Mr. Ricketts in 1892 and since then has been to some extent cultivated

* Note submitted to Government of Mysore.

at the Lal-Bagh in Bangalore and from those gardens fairly large numbers of young plants have been supplied to various parts of India. So far as Mysore is concerned, nothing practical has resulted from the introduction of this plant; but just outside the borders of the State in Coorg, a small plantation of sisal hemp has been worked successfully for the past five years.

In 1914, in Bulletin No. 18 published by the Industries and Commerce Committee of the Mysore Economic Conference, I drew attention to the commercial possibilities of sisal hemp in Mysore; but so far no one has been induced to take up the cultivation of this species of aloe on a commercial scale. After an interval of four and half years, during which I have had opportunities of watching the growth of sisal hemp plants, I am still of opinion that its commercial possibilities in Mysore are very great; but I have realised that nothing is likely to result from advocating the formation of planting companies to take up extensive areas of land with a view to the establishment of large plantations.

Before proceeding further, it will be necessary to give some brief account of the conditions under which sisal hemp will grow. Mr. Cameron, at that time the Curator of the Lal-Bagh, in a paper contributed to the Proceedings of the Agri-Horticultural Society, Madras, in 1903 wrote as follows: "In my opinion, cultivation should be left to private enterprise, though in the case of arid tracts where ragi often fails to reward the raiyat, it may be feasible to substitute a crop of this kind; but that could only be done when a real demand for hemp arises at convenient centres. The advantages of cultivation may be briefly stated as follows:—

- (1) Land of gravelly and stony nature is suitable;
- (2) When land is planted up, the cultivation practically ceases for a period of four years or until

the matured leaves are ready for cutting;

- (3) On suitable land failure of crop has never been heard of;
- (4) The profit on an acre of land yielding crop is estimated at from Rs. 60 to Rs. 75 per annum."

"The large succulent growth obtained in rich land is inimical both to the quantity and quality of fibre produced; therefore somewhat poor land of a loose stony nature is always preferred, as in addition to giving better results generally it accommodates a larger number of plants to the acre. Mysore possesses plenty of such land, and if the latter can produce leaves of four feet in length it will do; but there is a reduction in value, as well as difficulty in extracting the fibre, when the leaves are under three feet in length."

From other authorities on the cultivation of sisal hemp, I have gathered information which may be briefly summarised as follows:—Sisal hemp will grow on arid land that seems incapable of any other vegetable life; but the best fibre is grown on a calcareous gravelly soil of medium quality. No fertilizer is ever used. Once the plant has taken root in the ground, no further attention is necessary and the cost of cultivation is negligible. The fibre is, however, difficult to extract by hand but is easily got out by suitable machinery. It takes from five to six years for the plant to grow to the proper maturity to begin cutting leaves. When the plant is growing, all its leaves point upwards; as the plants mature, the leaves begin to open; as they open, they begin to fall towards a horizontal position. As soon as the leaf becomes horizontal, it is perfectly mature and must be promptly cut in order to secure from it the most fibre in the best condition. If properly cared for, a plant continues to yield leaves for about fourteen years in rocky soil and eight years in fertile soil; but if the leaves which become horizontal are not properly cut, then the plant

throws up a stalk instead of leaves and this is the death of the plant. If the cutting of the leaves be neglected, the plant throws up a stalk and when the stalk appears, there is great danger that all the plants in its vicinity will also send up the stalk and die. When the plant reaches the limit of its age, this stalk grows from the centre of the plant and the plant dies. Leaves weigh from 1 to 1½ pounds and 1,000 leaves will yield from 50 to 75 pounds of fibre.

On suitable land, bearing 1,000 plants to the acre, the yield of fibre may be reckoned at not less than one pound per plant per annum or 1,000 pounds per acre. The fibre was worth in London about £30 per ton before the war and is likely to remain so owing to the increased cost of cultivation and difficulties which have arisen in two of the largest areas of production. These are Yucatan in Mexico and German East Africa.

It appears to me that the principal reasons why sisal hemp cultivation has not been taken up in Mysore although the plant grows readily enough and yields a high quality of fibre are as follows:—

- (1) Six years must elapse before any return can be expected;
- (2) The extraction of the fibre by hand is not possible as a commercial proposition;
- (3) The extraction of the fibre by machinery necessitates operation on a large scale and the investment of a large capital on machinery and plant;
- (4) There is no local market for the fibre and small parcels do not command a fair price when exported.

Objections of a similar nature and of equal or greater intensity retarded the development of the cultivation of both tea and coffee and the establishment of the tea industry in India is largely due to efforts on the part of the Government of India at the

outset. These industries are still mainly in the hands of European planters, though there is now, both in Assam in connection with the tea industry and in the South of India in connection with coffee, a marked tendency towards the development of Indian-owned plantations.

I have already referred to the plantation which has been started in Coorg and in course of time other sisal hemp estates may be opened out. There are, however, excellent reasons why the matter should not be left to chance. Moreover, it is desirable that the cultivation of sisal hemp should be so developed that the ordinary cultivators of the country should, as far as possible, participate in the benefits to be derived from it.

The Mysore Durbar obtains a not inconsiderable percentage of its revenue from mineral royalties and from the sale of electric energy which is still mainly used on the Gold Fields. Sooner or later, this source of revenue will be extinguished with the exhaustion of the Mines and it will be a wise policy, while there is yet time, to create new sources of revenue to take its place. The electric energy may be used for other purposes, provided industries are created which will employ the power. Satisfactory progress in this direction has already been made and there seems every prospect that, as electric energy becomes available, a market for it will be found in the growing industries of the State; but the gold royalties will gradually decrease and ultimately disappear and it will be sound policy to look well ahead and endeavour to create new sources of revenue. In the last few years, the public attitude in respect to the intervention of the State in industrial matters has completely changed and there is no reason why the Mysore Durbar should not take active measures to create new industries if it is in a position to do so.

It appears to me then that an excellent opportunity to do something in this direction is presented by the failure of private enterprise to take advantage of the natural facilities which exist for the cultivation of the sisal hemp plant. About one-half the area of the Mysore State is uncultivated and there are obviously tens of thousands of acres of waste land which could be well utilised for the cultivation of a plant which grows best on soils which are perhaps favourably described as being on the margin of cultivation.

If the raiyat were in full possession of the information contained in this note and further if he could be induced to accept it as approximately true, there is scarcely any doubt that, provided he was not asked to find capital which he does not possess, he would readily take to the cultivation of sisal hemp. The problem then to be solved is to convince the raiyat that it is worth his while to grow sisal hemp and this can only be done by removing the difficulties which have hitherto prevented the development of the cultivation. This can be done through the agency of the Economic Conference, the District Committees and the various associations which have been established to develop the material resources of the State. Village Committees have been formed in thousands and it is possible that village communal plantations could be started which would ultimately provide these local bodies with a revenue which could be usefully employed on the various schemes of village improvements which are under contemplation.

Government can assign land for the cultivation of sisal hemp free of kist for a period of say seven years, a sufficient time to enable the plants to be brought to maturity. It can supply the plants, charging only the actual cost, and deferring the payment till the raiyat begins to derive an income from them. It can also establish nurseries and model plantations in selected centres to demonstrate its faith in the future of sisal hemp in the Mysore State, and to afford ready

means whereby the raiyats can obtain young plants and instructions how to cultivate them; but it is necessary that Government should go a great deal further than this as individual raiyat will be unable to extract the fibre from his plants and, even if he did extract it by hand, he would be unable to obtain a fair market for it. Government must therefore be prepared to guarantee to take over the crop of leaves when they are mature and to provide the necessary machinery for extracting the fibre, also to undertake the marketing of the crop.

It is difficult to frame an accurate estimate of the returns to be obtained from the cultivation of sisal hemp, as I am not in a position to state what price the hemp will fetch five or six years hence and I can only make an assumption on this point. The price, in London, immediately before the war was from £28 to £30 a ton and it is almost certain that it will be considerably higher than this after the war. I think it will therefore be fair to assume that sisal hemp will realise three annas per pound or Rs. 420 per ton and as each plant will yield a pound of fibre and at 1,000 plants to the acre, the gross return will be Rs. 187-8-0 per acre. In 1914, Messrs. Kirwan and Elsee stated that, as a result of their experience, the cost of extracting and marketing the fibre was about Rs. 175 per ton. It is likely that this figure will be exceeded in the future as freights will certainly be higher but the cost of working under Indian management should be lower. Allowing, however, a wide margin for contingencies, we may put the charges under this head at Rs. 280 a ton which will leave the raiyat Rs. 140, equivalent to one anna per plant per annum. With a thousand plants to the acre, the raiyat may expect to obtain a net return of Rs. 62-8-0 per acre. It may easily be considerably more than this but it is hardly likely to be less.

It will serve no useful purpose to go into minute details as accurate data for them are

not available. I think it is sufficient to show that sisal hemp cultivation offers prospects of an extremely good return. My estimate of the prospects is strongly supported by certain general considerations about which there is no doubt whatever and which do not depend upon assumptions regarding current market prices. We know that the sisal hemp plants will grow in Mysore in a perfectly satisfactory manner and will yield a high class of fibre comparable with the best fibre produced in other parts of the world. Further, we know that the conditions in Mysore are such that the cost of bringing the plants to maturity, of cutting the leaves, of extracting the fibre and of putting it on the market will be less than in any of the tracts where sisal hemp is now cultivated. It is therefore quite certain that, if sisal hemp is grown in Mysore on a sufficiently large scale, it will be able to compete with plantations in other parts of the world.

I have no accurate figures regarding the total production of sisal hemp; but it is estimated that the world's consumption of binder twine alone is 250,000 tons per annum. India exports large quantities of hemp, chiefly sann hemp, a fibre inferior to sisal hemp and commanding a much smaller price, and the following figures extracted from the Sea-borne Trade Returns are of interest as showing how important the Indian fibre crops are :—

Year	Exports in tons	Value in rupees	Value per ton at port of shipment
		Rs.	Rs.
1914-15 ...	33,511	99,43,334	298
1915-16 ...	30,413	1,02,33,742	337
1916-17 ...	35,059	1,52,26,058	338
1917-18 ...	16,886	88,29,696	528

The great reduction in exports in 1917-18 is due to the restrictions on shipping as the

very high price realised clearly indicates a strong demand.

It is now necessary to indicate briefly the commitments of Government if these proposals are accepted for the encouragement of the cultivation of sisal hemp. For a period of at least ten years, Government will have to establish nurseries in many parts of the State and to maintain them for demonstration and for instructional purposes. An average of a lakh of rupees a year will not be too much to spend on this account. For the first six years, there will be no return; but after the expiry of this period, the raiyats should commence the repayment of the cost of the plants supplied to them. At the end of four years, it will be necessary to purchase machines for extracting fibre and to set up central depôts for the receipt of leaves, where the fibre will be extracted. We may take it that each central depôt will cost at least Rs. 60,000 and that will be capable of dealing with 500 tons of clean fibre per annum, equivalent to the produce of 1,120 acres. This is the most economic unit that can be employed for extracting fibre; but in places where so large an area is not brought under cultivation, smaller machines capable of dealing with only 200 or 300 acres can be employed at the outset. There can scarcely be any doubt that once this cultivation is started on the lines herein set forth and once the profits are realised, it will spread very rapidly and will probably extend to hundreds of thousands of acres. Roughly, each thousand acres will require an outlay of Rs. 60,000 in machinery and plant and that each thousand acres will yield nearly two lakhs of rupees worth of fibre. Obviously, the more extended the scale of cultivation, the greater will be the return realised.

It would be comparatively easy to produce definite figures based on certain assumptions; but this I prefer not to do and to leave the result stated in a somewhat vague form. I have no doubt that if this

matter is taken up in a thoroughly efficient manner and carried on strenuously, it will result in at least a lakh of acres being brought under cultivation within a reasonable period and from this area, gross returns of from Rs. 1,75,00,000, to Rs. 2,00,00,000, will be obtained. Such a result is well worth investing a lakh of rupees per annum for a certain number of years. The capital expenditure necessary after the cultivation is established, requires no justification. There is not the least doubt that it will yield a very handsome return. To deal with a hundred thousand acres will require about 5,000 Horse Power and in many parts of the State this power will be available in the form of electric energy and where such is the case the working expenses will be greatly reduced.

So far, I have only considered the question from the point of view of producing a crop which can be exported ; but there is no reason whatever why the raw material should not be worked up into finished goods in this country. With electric power available, factories for the manufacture of ropes and twine can be established and worked as cheaply as anywhere in the world. It is not necessary now to consider this in detail. With large supplies of raw material at hand, there is no doubt that private enterprise will, in due course, be forthcoming.

The six-room dwelling of a Colorado farmer is a striking illustration of odd building construction with cement. The house is 48 by 18 feet in size, and has the outside appearance of an ordinary concrete building, but consists of bales of straw coated with cement. After laying like stone blocks, the bales were covered with cement mortar, a sprinkling of pebbles being added in the outside finishing coat. Windows were fitted into the thick walls, a tile roof was provided, and the walls and ceiling inside were plastered. Not including labour, the cost was about £54, says *Popular Science Listings*.

OPENINGS FOR YOUNG MEN.

BY S. C. SATYAWADI, M.A.,

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I confine my remarks to Young India, *i.e.*, people who are taken as the standard for judging a nation's stage of development, who serve as the basis for progressive measures and form the backbone of national vitality. At present, to be more concrete, the paper therefore deals with the youths of the middle classes, some from the lower and none from the higher.

Before entering into the present situation, a historical review though brief would greatly assist the due handling of the subject. These young men till the advent of the Western nations generally carried on agricultural operations with or without an establishment of domestic servants in the small village republics. Also they could win distinction in the Army and the Navy within the restrictions imposed by their circumstances. Lastly, along with high educational careers, they had industrial and commercial enterprises to give a scope to the human tendency to develop or at least to live and live well.

With the advent of powers materially superior in strength and obviously determined to carry out an industrial policy of its own backed by military force and wise use of better methods, most of these openings went out of doors. Process was openly destructive in a very few cases, *e.g.*, Muslin of Bengal but generally peaceful absorption. Foreign piecegoods replaced locally woven cloth. Army and Navy were closed for Indians. Ultimately, only two lines remained for Indians, where they could with any pretension at self-respect earn a livelihood—*viz*: agriculture and state rather Government service. Also other circumstances including a defective system of education though nobly

inspired at start but imparted through an ill-inspired machinery accentuated the increasing narrowness of careers open to talent.

The natural result was inevitable. Partly with an inert agricultural community and partly with a superfluity of state servants and appendages, the country began to move rapidly down the incline to poverty. Personally when I look back at this period, I am reminded of the march of Aurangzeb in the Deccan. The great army of Government servants afforded the only place for getting an honourable living. But the huge army is not the only evil as in a way it ensures security. But the attendance of camp-followers like lawyers, amins and process-servers, "twenty times as numerous as the effective strength" became the pests of society. And as Lane-Poole says, "so vast a host was like a plague of locusts" to the sole productive industry of agriculture and was enough to suck up the essence from the "Laboratory of Life" the earth.

Congestion in agriculture and keen competition in State service resulted in a deadlock. An opening in the shape of State disservice crept up giving some irresponsible socialistic ideas and disbursing among others more extreme nihilistic ideas. Remedies mild and drastic have been tried with sufficient success. But the common folk in his shrewd common sense cries for a remedy that goes to strike at the root of the malady and that cry is for fresh openings.

It is for facts to show whether he is justified in raising the note often unpleasant to many. You will find quite a large school of thought that would insist on the perpetuation of this misery under the ill-disguised hypocrisy of sympathy. This school shuts its eyes to the national subservience to others in matters of daily needs, proves its theories by showing that men work for University certificates while they can better employ themselves in other ways, roar with wild glee when they find bright youths launching themselves on the sea of life in their paper

canoes and yet close with the well wishers' remark that such men should always be "the hewers of wood and drawers of water."

But when the river gets a flood, these dams only raise the level to increase her force and everyone including the Government become alive to the needs of a nation. And the present position is that there are promises for fresh openings in every direction. But they are promises. To be in touch with the present the fresh openings have not borne to the people quite a similar rosy view. Agriculture is in its struggles with the users, and the Army and the Navy afford consolation to a microscopic part of the nation. There is more scope in the participation in the administration of the country and also some openings have been made for Typists, Accountants, Babus. But tested on the stone of economic advantage these carry far enough politically but not materially. These openings are necessary for material welfare but must lead to what is called increase of productive labour. And the only way to do it is to revive the old discovery by Famine Commissioners of 1889—Diversity of Industries.

I am not going to discuss the superiority or inferiority of industries to pure agriculture unsoiled by the smoke of the factory chimneys as it is beyond my subject. Industries are here at a very low ebb and without wasting time on the innumerable causes for the absence of openings therein, I shall discuss the merits of the chief ones. Want of raw material, manual labour and capital I reject at the start. I lay stress on quite other things—lack of technical knowledge, lack of organizers, lack of opportunity and lack of initiative.

To take these in order—

High technical knowledge may come when the beneficent boons recommended by the Industries Commission after long deliberations of three years bear fruit. But in the present also, the accumulated stock of knowledge in India is quite enough for modest

enterprises; small treatises, ordinary technical details can be had; coupled with the training in the school of life, knowledge is ample. A carpenter's work does not need much knowledge, and improved work therein can be acquired even now. In sericulture, glass-blowing, bee-hive industry, minor forest industries, organized dying, toy-making, artistic industries and ordinary crafts, no high technical training is essential and for all of them more than enough material is easily available. As regards industries requiring more technical knowledge Indians do stand at a certain amount of disadvantage, but it is more often due to some ill-judgment of the organizer rather than the absence of technical knowledge. I have seen one case of sugar enterprise in which promoters and directors started a factory without seeing whether they would be able to get cane juice. It was sold out and the European purchaser arranged to refine sugar not from juice but molasses which he could get from other places and could even import. This whole failure was due to the fact that there was no businessman in the directorate, which consisted mostly of lawyers and public men. Hence even though very highly competitive industries are yet out of question, there are enough for which with perseverance and sound common-sense a man can push up. To name a few, fertilisers, organization of cottage industries, transport (land and water), small industrial banks, distributing shops, etc., afford quite enough openings.

As for organizers, master-workmen, foremen, *i.e.*, men to fill the commissioned and non-commissioned ranks of officers we have not to seek them far. If men can toil and toil for the B. A. degree in spite of failures, can we not divert them to industries? If a man able in all ways finds service too narrow to give vent to his capacity, will he not be overjoyed to get a new opening? It is just at present that industry opens a line for even average men. Its condition at present is what the state of Government service was a

few decades back. There is no recruitment to higher grades and the least sign of something above the low industrial average is sure to get its recognition and push up the man. After some years industries will bring about as keen a competition as Government service and if time can be held by the forelock, it should be done at present. Organizers and middle-class men are more than enough for these lines in number and worth.

As regards opportunity I have said something above. Government attitude of indifference and often of impatience towards industrial development affords the best opportunity and should be availed of to show the Government what is actually needed. The obstructions put forward by petty authorities are sure to disappear when capable men fill the industrial ranks and not conservative Banias with a hereditary knock to say "Jo huzur." The unequal competition that is brought about by foreign politics and the injustice that is often done thereon will disappear with the rise of public opinion, strength of the people and chiefly with the ability of the men who can assert their cause in the teeth of unreasonable opposition. These are questions for higher grades. For ordinary and our purposes, many of these disappear if there is enough skill in the operator.

But still industries have not succeeded well because the chief cause has been lack of initiative. 'Who will bell the cat?' is the problem. There are no bright lights to guide. Your own lodestar must help you. Those already in the field, the Europeans and Anglo-Indians regard it as a profanation to tread on their ground. Instead of lighting beacons, they will raise whirlpools for you. And you succumb because you sail for the deep sea when you have not well reconnoitred your own shores well seen and studied the creeks and corners to know where you have shoals to strand your ship and where you have havens to shelter in storms. Secondly, the Indian disadvantage has been that the intelligent men are mostly diverted to Government service under the temptation

of fixed incomes. And still in spite of all stupendous gains the hitch is—who will cross the threshold to glory. Uncommon glory too is as much an object of common dread as uncommon misery and shame.

But this state of affairs is only transitory. An era of industrial development is sure to come and that too shortly. I shall not quote proofs to show that the present times are the crucial moments in the industrial history of India. The choice is between industrial supremacy and economic slavery.

There have been under the contemplation of the Government of India several schemes to better utilise India's illimitable resources. The Industries Commission has foreshadowed what is to come as far as the Government is concerned. But who gets the benefit depends more on the issues of these times. The hopes raised by the recent change of vision by the Government would be only chimerical unless men come forward for industries in the right spirit. I have shown that they can come with much gain to themselves. I may now tell you that the gain will be greater still to the country. Because the boon of the Government if not taken by Indians would benefit Mr. Jones and Mr. Smith of European mercantile firms to further fleece out India. Or worse still, as Sir William Clark pointed out, "the manufacturer who now competes with you from a distance would transfer his activities to India and compete with you within your boundaries." The danger may not be well appreciated. It is there and if it is the result of Indian Industrial Renaissance, the nation is doomed and posterity will only curse the day when the present generation in its idle weakness let the time pass.

And there is the other side to the shield. If this great danger is arrested, there is bright sunshine behind. It is no use saying that the Government did this or that. Assert your claims when you have reason to. Win them in a spirit of reasonable toleration but win them as their loss means perhaps much greater danger to your later activities. There is no cause in murmuring against misfortunes and hard work. All in every sphere of life have them. And then opens out a vista of happiness.

Necessarily, this need of youths in the industries imposes some responsibility on those who cannot go in industries. It is for

them to see that right men go in the industries with right knowledge and with opportunities. So the duty divides into four heads:

- (i) Selection of right men,
- (ii) Dissemination of proper information and knowledge,
- (iii) Establishment of opportunities,

and finally (iv) Watching such careers.

For all organized bodies having within the competence of their rules to go a little beyond cutting the intellectual teeth on discussions, I would make bold to suggest that they should, if they agree with me, form a scheme to carry on the functions above-mentioned without, of course, disturbing their other duties. I would, however, point out that unless the scheme is decidedly useful, mere idea of patriotism should not be the only basis.

As a preliminary step, you have to open an Information Bureau where you will collect all possible information about all Indian industries and also sources where such information can be had. Then find out possibilities of success and in some cases watch men who have already entered in Industrial enterprises. You can then get right men and help them financially if need arises. The principle, if accepted, can be formulated into a regular scheme and if properly managed should not entail much particular labour on any person of the Association.

But before I close, I think I should point out two safeguards that should always guide men in the promulgation of the scheme. Firstly, no one who can get a satisfactory and decent living elsewhere should be diverted to industries. Secondly, those who take the industrial line should devote at least two years as students in that branch without any idea of remuneration. It is here that many get their quietus. A man may fail ten times in his Intermediate but ever if the Spirit of Kindness desires him to go to industries, his evil fate directs him to secure at least what he would get after becoming a graduate.

I wish I had dealt with the portion about opportunities more in detail, but my short experience withholds me and inability to advance it precludes me from ever going much beyond repeating the usual War Cry of the Industrial Army—

WORK AND WAIT.

THE WAR AND INDIAN TRADE.

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F.E.S., F.S.S.,

Director of Statistics, India.

IT is a great pleasure to renew one's acquaintance with Dacca. It is, as you are aware, my official birthplace as I came to India as Professor of Economics in your College. I have never been able to shake off the wonderful and inexplicable but absolutely irresistible fascination of Dacca. I miss many old friends here to-day. Some have passed peacefully into the Great Beyond, others have retired under the Atropos of our age rules to the *otium cum dignitate* of a pleasant existence in their native districts, while others are still in the saddle helping to guide the fortunes of this province. Nearly ten years ago I lectured to a Dacca audience on "Some Aspects of Indian Commerce and Industry." To-day I find myself in a similar position, having been asked to address you on the effect of the war on India's trade, and I shall try to sketch, in the briefest outline, the main effects of the war on our trade and the lessons which the shears of war have laid bare to us.

In the first place the persistent demands on the part of our Allies for our products stimulated the export of commodities of vital or national importance, and at the same time altered the direction of our trade with countries abroad. Secondly this demand reacted on Indian industry. Necessity became the mother of invention, and the war with all its attendant evils proved a great impetus to industrial development.

Despite the phenomenal shortage of ocean freight and the restrictions on the outflow of our goods, especially to neutrals, the value of the overseas trade in merchandise was

last year† nearly Rs. 393 crores as against Rs. 370 crores, the pre-war average. Imports of merchandise, as compared with the five pre-war years, increased by 3 per cent, exports by 6 per cent, and re-exports, owing to the scarcity of shipping and the necessity on making India for the moment a distributing centre, showed an increase of no less than 97 per cent. A part, in some cases a very large part, of the increase in the value of the imports and exports was due to a rise in prices. Imports last year† for example, were valued at Rs. 150 crores or Rs. 79 lakhs more than in 1916-17, but when the prices of the latter year are applied, the value is reduced to Rs. 122 crores, thus showing an increase in the import trade on account of higher prices of 23 per cent. The actual volume of the trade decreased by 18 per cent so that Indian importers had to pay 23 per cent more to get 18 per cent less. The actual declared value of exports last year† was Rs. 233 crores, while the value calculated at the prices of the previous year was Rs. 216 crores, or in other words, there was a gain of 8 per cent on account of higher prices. The volume of exports, however, was as compared with the preceding year, 9 per cent less. Thanks to the good monsoon of 1917, our harvests, the mainstay of the country, were plentiful, and it was, therefore, possible to export considerable quantities of munitions of war to the United Kingdom and the Allies. When we remember that in spite of immense difficulties in freight, India sent goods to the value of Rs. 127 crores to England and to other parts of the British Empire, and Rs. 90 crores to the Allies, the efforts of commerce and industry can be termed nothing less than an epic of endeavour. The exports of food grains, especially wheat, barley, and gram, jute manufactures, tea, tanned hides, chromite, piglead, vegetable oils, rubber, cotton manufactures, and cigarettes were greater in quantity than in the pre-war

* An Address at the Social Service Exhibition, Dacca, March 6th, 1919.

† 1917-18.

period. Imports of sulphuric acid, a supremely important commodity to the industrialist, dyes, metals, motor cars, kerosene oil, paper, wood pulp, provisions, salt, railway materials, cotton and woolen goods were, owing to the war, much below our pre-war requirements.

It will now be clear that with this large demand for Indian products and the difficulty in obtaining imports either in the form of merchandise or treasure in payment for these, the gap between exports and imports, the balance of trade, was bound to widen. The favourable balance of trade grew to unprecedented proportions. I do not propose to penetrate the thorny labyrinth of facts relative to India's balance of trade but merely in passing to make a few remarks on a plain fact, sometimes very dull and very little understood. This permanent excess of exports over imports, this so-called favourable balance of trade, exists simply because there are other things, such as interest due to India's creditors, pension and other Home charges to be paid for, besides the imported goods. Before the war these transactions were done with ease and rapidity and with the minimum movement of specie. Gold in international trade moves very little, and imports of goods are paid for by exports. The transactions are ordinarily settled through the great clearing house of the world—London. Since the war the balance of our trade between our customers and ourselves has been settled, to an extent that was not possible before the war, direct. In war time the balance between each pair of countries, *e.g.*, between India and Japan, and India and the United States, has been of real moment. Japan and America have, indeed, sent us considerable supplies and gold. London is no longer a free market for gold as the belligerents are conserving to their utmost their supplies of the yellow metal. But these are temporary and abnormal conditions, war and not peace problems, and can be ignored in discussions of permanent pro-

positions. Without going into the hazy and hazardous, unrecorded or "invisible" imports, or the oft-told tale of the accuracy or inaccuracy of trade statistics, I need only say that the excess of exports over imports was £61,000,000, and to liquidate this large favourable balance of trade, treasure and funds were imported to the extent of nearly £50,000,000.

	1909-10 to 1913-14 Pre-war average	1916-17	1917-18
	£	£	£
Net exports—(excess of exports over imports ...	52,179,000	63,677,000	61,420,000
Net imports of treasure and funds ...	52,464,000	33,282,000	49,830,000
(a) Council drafts, etc. ...	28,416,000	31,925,000	34,553,000
(b) Treasure	24,048,000	1,357,000	15,277,000
Balance of Trade in favour of India ...	...	30,395,000	11,590,000
Balance of Trade against India ..	285,000	..	...

The balance of trade, *as adjusted* above, was in the pre-war years against India, notwithstanding that there was a large excess of exports, over imports, but in the last two years there was a large balance, after adjustment of the available statistics, in favour of India. India has in other words been assuming for the moment the rôle of a creditor rather than that of a debtor country.

The deplorable waste of resources involved in the absorption of the precious metals has been strikingly brought out during the war. In the five years ending March 1918, gold was absorbed to the extent of Rs. 81 crores, or more than one-half of the world's production in an ordinary year. The net imports of silver were, in the same period,

nearly twice the world's annual production. Since April 1915, 1,200 millions of silver rupees, as Sir James Meston pointed out a few days ago in presenting the Financial Statement in the Imperial Legislative Council, had been drawn from our mints at Calcutta and Bombay which have been working night and day to cope with this insatiable demand. In December, no less than Rs. 834 lakhs were turned out, a world's record. From April 1918, 200 million ounces of American silver have been and are coming to India. There is no justification for this continuing waste and unless it is checked and the hoarded coins restored to circulation, Government may be forced to reconsider the whole basis of India's currency and exchange policy. But that is not all. If this country had not this ingrained fondness for the precious metals, and if in place of taking silver from America had preferred credits at 5 per cent per annum we should have received in interest alone—Rs. 300 lakhs (£2 millions)—sufficient to pay the cost of Public Instruction in Bengal for more than twelve months. We should be much better off if we imported goods in preference to the precious metals. If the metals are hoarded in the form of jewellery, etc., they are put to non-productive uses; if they are absorbed, then prices tend to rise and this brings in its train a host of difficulties. I shall have more to say on this appalling dissipation of resources when I come to what may be called the effectiveness of Indian production.

With these remarks I now plunge in *medias res*. The monsoon of 1917, unlike that of 1918, was an exceptionally good one, with the result that food grains in the year 1917-18, especially on account of favourable prices abroad, were profitably exported. The exports of food grains were over $4\frac{1}{2}$ million tons valued at Rs. 54 crores. The quantity exported was only 100,000 tons above the pre-war quinquennial average, but the value was greater by nearly Rs. 8 crores. We

were able to export nearly 2,000,000 tons of rice, and arrangements were made for the Royal Commission on Wheat Supplies to buy the Allies' requirements of rice estimated at 100,000 tons monthly from Burma, and the United Kingdom for the first time took the largest share of the trade. Burma which provides more than three quarters of the rice exported from India has diverted to India, since the failure of the monsoon in 1918, her surplus exports. Owing to the wheat harvest of 1917 being the best on record, the exports of 1917-18 were nearly double those of the previous year and 11 per cent above the pre-war average. The wheat bought for export on behalf of the Royal Commission during 1917-18 amounted to nearly 1,580,000 tons. The exports of gram, pulse, maize, barley, jawar and bajra were 68 per cent above the pre-war average. All these exports of food grains took place in the year ending 31st March 1918, and, therefore, before the unsatisfactory monsoon of 1918. As everyone in this province knows, there was prohibition on export of raw jute to all destinations except under license and this produced a fall of 64 per cent below the pre-war quinquennial average. The exports were, in fact, the lowest on record since 1877-78. The jute mill industry was more fortunate than the growers. The exports of jute manufactures were valued at Rs. 43 crores as compared with Rs. 20 crores, the pre-war average. The net profits of Jute Mill Companies have amounted during the last three-and-a-half years to nearly Rs. 30 crores. During the three years ending 1917-18, 1,073 million bags were shipped on Government account and 375 million yards of cloth. There were last year* 76 mills at work with 41,000 looms and 834,000 spindles which gave employment to 266,000 hands. In the tanning industry the war has been a blessing in disguise. The total shipments of tanned hides were double the pre-war average and

* 1917-18.

almost the entire quantity was shipped to the United Kingdom. At least three-fifths of the upper leather used in the United Kingdom in the manufacture of boots for the British and Allied armies is supplied from Indian tanned hides and the Controller of Hides informs me that most of this tanning was done in Madras and Bombay. In addition to this about 40,000 hides were supplied monthly from the Bombay tanneries to Cawnpore for army requirements in India. The best class of hides from Northern India which were formerly exported to Germany and Austria are now being sent to the Southern India tanneries. Shellac, mica, wolfram, manganese, etc., have also been exported in large quantities to the Allies. Tea was exported in 1917-18 to the extent of 359,000,000 lbs, 35 per cent above our pre-war average exports and easily a record export. 90 per cent of these exports was from Bengal and in this connexion the direct shipments to Canada and to the United States of America are an interesting feature of the tea trade in war time. The Indian cotton industry has increased its production by 46 per cent as compared with the pre-war period. The exports of Indian made piece-goods in the same interval have grown from 90 million yards before the war to 189 million yards last year.

India's chief import is cotton piece-goods. Owing to the war the quantity imported decreased from the pre-war imports of 2,600 million yards to 1,500 million yards, a decrease of no less than 42 per cent. This explains the large rise in the prices of dhutis and saris which is a matter of vital concern to all of us. The value of the goods, notwithstanding a decrease of 42 per cent in quantity was 9 per cent above the pre-war average. The share of the United Kingdom in grey goods has decreased since the outbreak of war from an average of nearly 99 per cent to 87 per cent, in coloured goods from 93.5 per cent to 91.8 per

cent, while her share in imported white goods has increased from 98 per cent to 98.8 per cent. In the same period Indian mills showed an increase in the production of the finer varieties, particularly coloured goods, and also increased their production of yarn. The interesting decrease, since the outbreak of war, in the imports of iron and steel, sugar, railway plant, and kerosene oil need only be mentioned. The value of railway plant and rollingstock last year* was only one-ninth of the pre-war average. The imports of kerosene oil were only 31,000,000 gallons as against a normal pre-war figure of 67,000,000 gallons. Similar instances of the curtailment of imports of primary necessity could be multiplied.

The direction of trade has changed as a result of the rapid march of events in the fifty-one months of war. We are now dealing with the British Empire to a greater extent than we did before the war, the share of the British Empire being 57 per cent as against 53 per cent in the pre-war period. The profitable markets lost by Germany and Austria have been taken temporarily mainly by Japan and the United States. Imports from Japan last year* had increased by 400 per cent above the pre-war quinquennial average, while the exports to Japan increased by 103 per cent. The imports of cotton piecegoods from Japan, for example, have increased in a phenomenal degree :—

	Grey (unbleached)	White (bleached)	Coloured, printed or dyed
	Yards	Yards	Yards
Pre-war average-- (1909-10 to 1913-14) ...	2,559,000	48,000	521,000
1917-18 ...	73,278,000	2,602,000	18,676,000

A predecessor of mine, the late Mr. O'Connor, Director-General of Statistics,

* 1917-18.

wrote in the Review of Trade for 1888-89 "Imports from Japan are quite trifling, averaging less than three lakhs annually in the last five years, and there are no indications of an increase unless the imports of copper should be resumed." Imports last year* from Japan amounted to over Rs. 18 crores and exports to that country to Rs. 34 crores—the total trade exceeded that with other countries except the trade with the United Kingdom. The value of the trade with the United States has grown to 200 per cent what it was in the pre-war period being second only to Japan.

Now with regard to Indian industries. The large changes in our foreign trade reacted, as was to be expected, on Indian industry. The share of manufactured goods in the export trade of the year increased to 31 per cent from nearly 24 per cent, the pre-war average. We have already passed in review the unparalleled prosperity of our Jute and Cotton Mills. The restriction on manufacture abroad and the consequent demand for commodities were an impetus to industrial development. The use of indigenous-tanned stuffs has been extended by the Tanning Research Factory and by the appointment of an expert tanner by Government. The Tata Iron and Steel Works, designed and erected by Americans, have, since the war, been a national asset. These turn out 300 tons of rolled steel per diem and it is proposed to increase this to 1,500 tons, which is about one-third of the requirements of the country. At Jamsedpur (Sakchi) about 11,000 workmen are employed by the Company and in addition there are 2,000 workmen under contractors, making a labour force of 13,000 men whose wages amount to Rs. 2 lakhs a month. The Sandal-wood Oil Factory in Mysore is another example of an industry brought into existence since the war. Sandal-wood formerly found its way to Germany where the oil was extracted from it. The Oil Factory at Bangalore which commenced work in May 1916, now produces

5,000 pounds of oil a month, and the net profits have already amounted to over three times the original outlay. The large output of the mines near Namtu belonging to the Burma Mines Company, Limited, is another instance and indeed this promises to be a second Broken Hill, the great centre of silver production in New South Wales. The production of refined silver has risen from nil to 1,525,844 ounces between 1915 and 1917 and the production of refined lead from 6,947 tons to 16,957 tons. These facts speak for themselves. No one who studies the progress of Indian industry not merely during the last ten years but since the outbreak of war as published in the Commercial Statistics of the Government of India (Statistics of British India. Vol. I—Commercial) can fail to be struck by the industrial progress in this country. One has only to scan the tables in that volume of our great organized industries of jute, cotton, tea, and coal, not to mention other power-using industries, such as the iron and steel industry, woollen mills, oil and paper mills, tanneries, and petroleum refineries in order to see the progress that has been made.

During the stress and strain of war the importance of a definite Government policy for the encouragement of industries has been as clear as sunlight, and steps have been taken in spite of not inconsiderable difficulties. Looking back over the war period we see that the Government of India have assisted industrial development in several ways: (1) by taking all possible steps to guard against the unnecessary import of articles which are or can be produced in India. This has led to new openings for industries in India in great numbers; (2) although technical experts could not be readily obtained on account of the war, expert knowledge has been so far as practicable organized for the first time and made available to industrialists seeking to begin new concerns; (3) new industries have been assisted

and encouraged, as the Hon'ble Member for Commerce and Industry pointed out in the Imperial Legislative Council in September 1918—"Caustic soda, magnesium chloride, thymol, sandal-wood oil, copperas, zinc chloride, and refined nitre are chemicals which have now been made in India for the first time on a commercial scale. Ferro-manganese is being produced in large quantities and has even been exported. The manufacture of micanite has been taken in hand by a private firm and by the East Indian Railway. The production of silicate bricks for lining furnaces has been developed so far that it is hoped that India will soon be independent of foreign imports. Great progress has been made in the output of accessories for the textile and tea industries;" (4) industries already established have greatly increased their output since the war. I have already referred to the effect of the war on the jute, cotton, and steel industries. In this connexion it is often not realised how far Indian industries have supplied the Army Department with goods that, before the war, were chiefly imported. In 1918, at least 30,000,000 yards of khaki drill and of grey and bleached cloth were purchased in India as against 610,000 yards before the war. Webbing and tapes, the product mainly of small artisans, have been purchased to the extent of 49,000,000 yards. The purchases of Indian made flannel were 850,000 yards against 32,000 yards before the war and of grey-coat-cloth 650,000 yards against 16,000 yards. The output of boots last year, two million pairs, was more than twenty times the pre-war figure.

Let us now very briefly—for I am conscious of having wearied you—try to outline broadly and sympathetically the new stand-points from which the industrial field has to be regarded. How are we to promote Indian commerce and industry? How are we to promote both our foreign and internal trade in the period of reconstruction? The answer has been authoritatively and completely

given in that monumental report—the Report of the Indian Industrial Commission. There is, however, one topic in this Report that has not received anything like the importance which it deserves. I refer to the effectiveness of industry—the production of goods which are cheap in comparison with their quality. To secure effectiveness land, labour, capital, and organization must be put into our products with the maximum of efficiency. This effectiveness is at the basis of all prosperous trade. Professor Taussig, Chairman of the United States Tariff Commission, in an address to the Chamber of Commerce of the United States, at Chicago, in April last year, pointed out that "the effectiveness of labour and capital means something different from that which is usually implied by the word 'efficiency.' 'Efficiency,' as that term is often used, refers to special and individual skill, intelligence, and activity on the part of the individual workman, to his mental endowment or personal aptitudes or muscular strength. Now, it is true that the high standard of living and the greater spirit of activity in this country do bring it about that our workmen are, man for man, efficient than those of foreign countries. But it is not solely, or even primarily, efficiency in this limited sense that I have in mind when speaking of the effectiveness of our labour and capital. I refer to the cumulative influence of all the factors which combine to bring about the final production and final putting on the market of the exported commodities. The factors are many and diverse; not only the individual efficiency of the men, but ingenuity on the part of inventors and engineers in perfecting machinery, skill in the designing and organization of plants, brains and enterprise in management, intelligence in the distribution and sale of the goods. No small part is played by transportation and especially by inland transportation. Whatever may be charged against our railways, they have succeeded in cheapening transportation immeasurably.

especially in long-distance hauls, and they have been a powerful factor in increasing the effectiveness of the total labour of the industrial processes. And, throughout, the thing which probably tells most of all in assuring a combined effectiveness of our labour and capital is industrial leadership. It is this which has made the modern economic world; it is this which justifies business and the profits of business. I need not say that this means also leadership in service. Successful leadership implies as its end and purpose, not money making, but service in promoting the effectiveness of industry."

Let me illustrate this with reference to the jute industry. The prosperity of our jute cultivation and of all those who depend on jute for their livelihood turns on the production of a large quantity of jute, raw and manufactured, and on its exchanging these products for other products. To produce these commodities cheaply means that quality as well as quantity must be preserved. An article of good quality may be high in price, but its quality must be so good as to make this high price worth while. I have here samples of sand bags captured from Turkish and German trenches. Side by side there are Bengal sand bags. You will note that the former are made of paper yarn and the bags are excellent substitutes for the Bengal product. Now, if the gunny bag is to compete successfully with these textile and textile materials, effectiveness in production is essential. That means a large production of jute, grown at remunerative prices, and still cheap enough to enable the manufacturer to compete in the world's markets. It means efficient labour, and Indian labour is costly, very costly. The outturn of labour is comparatively low and the cost of supervision, as the Chairman of the Bengal Chamber pointed out some days ago, great. It is, however, interesting to note that the Bengal mills are now "getting off" the looms in 13½ hours what was previously obtained in 15 hours by an excellent system

of shifts by which the labourer is usually employed for 8 or 9 hours a day. Intensive labour worked on an organized system of shifts pays. In no other industry, perhaps, in India is organization as a factor of production more carefully studied than in the Bengal Jute Mill industry. It is unfortunate that the Bengalee labourer cannot hold his own against his confrères from other provinces. It may be that the profits from growing jute and rice are sufficient to enable him to live from harvest to harvest without adding to his earnings elsewhere. It may be, too, that he has no desire, not having tasted the benefits of education and a higher standard of living, to rise in the world and to enjoy the fruits of efficient labour. Still the fact remains that the Bengal Jute Mills find it profitable to use labour from other provinces. I am indebted to one of the leading representatives of the Industry for statistics which show that in 1902 Bengalees formed 28 per cent of the whole labour force in certain mills. They are now reduced to 10 per cent, their places being taken by labour from Bihar and Orissa and the United Provinces, and also from Madras. Not only is the proportion relatively smaller, but the actual number of Bengalees employed in the Jute mills is absolutely less than it was sixteen years ago. I am also convinced from the most careful evidence which I have collected that the middle-class Bengalee does not take kindly to industrial enterprise. Even in the skilled class of labour the Bengal jute mill industry has to depend on imported labour.

I have taken the Bengal jute mill industry as an example of the importance of looking to effectiveness of production during our reconstruction period. Rome was not built in a day and we cannot hope to secure the ideal in a day. At the same time it would be ungenerous and unbecoming to deny that there has been amongst us a spirit of apathy and too strong a pedantic respect for mouldy precedent. The three

great requirements of India at the present time are (a) more and better education, (b) greater banking facilities, and (c) more adequate and easy means of transport. I do not propose to refer to (b) and (c) except to remark that the Industrial Commission has recommended the appointment at the earliest possible date of an expert committee on banking to consider this all-important question. As regards communications I need only say that the Government of India are in the coming year to undertake the biggest railway programme ever yet undertaken. It is proposed to spend no less than £17½ millions, an imposing figure. The previous record was £12 millions and in the war years, now happily behind us, the programme had fallen to £4 or £5 millions. This is an augury of the coming reconstruction period when India's commerce and industry will, it is hoped, greatly expand. It is with regard to the first of these three problems that I shall refer, as our whole future success in commerce and industry depends on education.

Education is of sovereign importance because it is the key to employment and prosperity, and indeed to all national advance. I confess to being an enthusiast on this, and the more we examine the problem from an industrial and commercial standpoint, the more do we see how true it is that until primary education is more widespread, industrial advancement will have no sure foundations. There will be no raising of the standard of living and no enhancing of the value of the people's labour until primary education is more accessible. Our secondary and our collegiate education with the terrors of the examination hall do anything but divert our young men from literary or legal careers. There is here a grave loss to the community because, as Sir James Meston puts it, "In all these young men, who now hang on to the skirts of chance, there is material for increasing the wealth of the country. They could be used, and are urgently

wanted, in trade and industry, in the handling of labour and the preventing of waste. Give them a sound general education, apprentice them in time to business, and they will have an economic value. But get them half-taught, consume their best years in a struggle which leads to nothing, and what is your return but discontent and economic shrinkage"? We shall, by a better and different system of primary education, make the workman able to earn more and to be, in short, a more efficient worker. By secondary education we shall produce workers of ability, able to supervise the ordinary labourer, and by scientific, industrial and technical education in our Universities we shall be able to turn out men capable of undertaking administrative and industrial work. Both administrative and industrial work require apprenticeship and training. Sir Thomas Holland in his Convocation Address to the Madras University last November sketched in firm outlines the importance of reforms in Indian Universities—"If Universities are to retain their value in any civilised and developing country, they must, like business men, adapt their methods to the growing needs of the community. To what extent the Universities, by moulding the form of education, can contribute to the cause of industrial progress will depend on their recognition of the fact that practical appreciation of the physical sciences is of fundamental importance to every modern form of industry. * * * It is impossible to overestimate the value of scientific research in dealing with the raw products of India. Until we know more about their nature it is impossible to turn them to industrial account. There is an enormous mass of material in India awaiting investigation and unlimited field for post-graduate research work. India loses millions yearly because its raw materials are exported in an unrefined or unmanufactured state."

It seems to me then that we must completely overhaul our educational policy. We seem committed to it. We have not, it is true, access to the purse of Fortunatus, but nevertheless we must set wide the gates of our Universities. In this every day world of ours workers must be helped by the

Universities. Without becoming purely utilitarian the Universities must teach applied science and keep in closest possible touch with the whole realm of industrial and commercial advancement. Indian Universities, especially those in large centres of population, will have to be truly civic Universities. In their activities they will be many-sided. The teaching of technology and the encouragement of research will divert the mass of students from purely literary pursuits to the study of and command over those processes of agriculture and industries which bring material prosperity to India. As His Excellency the Viceroy said* some weeks ago, "We want Indian men, and not Indian men only as labour but as leaders who will turn their attention to industrial enterprise and equip themselves for a great industrial re-generation in India. We want to see men devote themselves to scientific research. We want to divert some of the great stream of students, which now pours into channels leading only to the clerical and legal professions, into channels which will lead to industrial and commercial enterprise. We have now before us the Report of the Industrial Commission which tells how this may be done. I can assure you that in the case of this Report, too, I have no intention of letting its volumes moulder upon our shelves. Action has already been taken upon it, and before a year elapses I hope to see the foundations laid of a scheme for progressive industrial development in India. But let me once more emphasise the point that it is men that we want to do this thing." The effectiveness of the factors of production on which I have laid perhaps excessive stress is of superlative importance at the present time. When it is remembered that 94 per cent of the population is illiterate as compared with 1.8 per cent in England and Wales, 1.6 per cent in Scotland, 17.4 per cent in Ireland, and 7.7 per cent in the United States and that it is only in the higher education of boys that our statistics will stand comparison with European countries, with America, and with Japan, the importance of more and better education as a means of improving the effectiveness of our industrial powers can scarcely be over-estimated.

FORMATION OF IRRIGATED PLANTATIONS.

BY L. P. MASCARENHAS,

District Forest Officer, Mysore South.

HAVING read an article by the Editor in the *Economic Journal* for December 18, on 'Fuel and Fuel Substitutes' and another on the same subject in the *Mysore Forest Association Journal* for October 1918, by Mr. H. Srinivasa Rao, retired Deputy Conservator of Forests, I have been tempted to send a small note on the formation of irrigated plantations, which can be easily opened with the abundant water supply available in Marikanave and Krishnaraja Sagara Reservoirs.

Taking the fuel question in Bangalore, the Editor of the *Economic Journal* clearly describes the difficulty experienced by the people in getting their fuel for every day consumption; similar is the case in Mysore also. When such is the difficulty for getting fuel for ordinary purposes, what prospect is there of obtaining timber fuel and charcoal for industrial pursuits. Our forests are situated miles away from towns and from tracts where industrial pursuits can be followed with labour convenience.

The Vedic hymns afford evidence that at the time the Aryans were entering their new Southern home, India was covered with magnificent forests; but with increasing population, extension of cultivation and multiplication, valuable fresh areas have been laid bare and the State has now to interfere in the way of stocking bare wastes and meet the wants of the people.

Formation of fuel plantations by the Forest Department and also private people was undertaken on a large scale in the Districts of Bangalore, Tumkur and Kolar and the species used was *Casuarina*, the beefwood of Australia, the chief reason for this extensive planting was the demand for fuel by the Mysore State Railways before coal was used. Unfortunately this hobby of raising fuel plantations did not spread out into the Mysore District, which had forests so close and fuel was brought into the town of Mysore very cheap. Time has changed the situation entirely and the people are now feeling the pinch.

* Convocation Address—Calcutta University—16th December, 1918.

The Sandal Oil Factory, Mysore, has been consuming a lot of fuel at present—all the available tree growth in swamps and glades nearby Mysore has been utilised and the people have now to depend on fuel brought from forests miles away; transport charges are exceedingly heavy in the absence of Railway communication.

With rough statistics available *re* consumption of fuel in the Mysore city, it is found that from November to end of May nearly one hundred tons of fuel are brought every day as also four to five hundred head-loads in addition; in the rainy season about fifty tons and two hundred head-loads come in.

Only a little of this quantity is brought from State Forests and all the rest from private holdings—the ryot just for the sake of a few rupees clears away all available tree growth in the land without knowing the ensuing danger.

What has happened in the country now is that all good land excluding bare and rocky waste has been utilised for cultivation and the existing tree growth cut away; now the stocking of these bare wastes with fuel trees is a difficult problem.

Insufficiency of rainfall is one of the greatest obstacles to the stocking of bare wastes. Such being the case, wherever the Canal Department has water running to waste or natural facilities exist for the construction of effective system of irrigation works and the requirements of the population in respect of Forest produce are insufficiently met, these irrigation works should be resorted to without hesitation, as the certainty and rapidity of success will repay over and over again the special outlay entailed.

The city of Lahore suffered for many years without fuel but the Forest Department came to its rescue by opening Sissoo plantations in 1866 under the Bari Doab Canals. The Punjab Forest Department has now taken up this work in right earnest since 1910, and opened of nearly 35,000 acres of plantation under the irrigation system. These plantations require two or three waterings in summer and Kannambadi can afford it whereas Marikanave with its large storage of water unused at present will welcome them.

It is high time, therefore, that a few Forest Officers are sent to Punjab to study this system.

LIFE ASSURANCE IN INDIA.

By "J."

THE fifth annual issue of the Returns from Life Assurance Companies doing business in British India published by the authority of the Government of India from the Government Central Press, Calcutta, at a price of Rs. 1-8-0 per copy is a useful volume full of interesting information. The returns contained in the volume appertain to the year 1917, and the publication consists of abstracts of accounts and valuation statements with an introductory note by Mr. Meikle, the Government Actuary. Both in form and arrangement the fifth issue is a great improvement on its predecessors. When after the promulgation of the Government of India Life Assurance Companies Act VI of 1912, the Government Actuary undertook to publish the returns of the various classes of Life Assurance Companies in India in one volume, the task was undoubtedly one of considerable difficulty. There were in the first place Indian companies as well as British, Colonial and foreign companies doing business and in the second place the Indian companies in themselves consisted of concerns of diverse classes, of varying magnitudes and of different methods of organization, work and account-keeping. To reduce the returns of all these to a system, print them in one volume and make them the subject of a useful and intelligent review was a task which required not only a high degree of expert actuarial training but also demanded infinite patience and an intimate knowledge for the psychology and inner currents of Indian company management. But the task has been attempted by Mr. Meikle with a degree of ability, tact and sympathy which cannot but excite admiration and after a perusal of the fifth issue of the annual compilation we can confidently say that the task

has been accomplished with a fair measure of success.

In this year's publication the admittedly cumbrous method of the former issues has given place to a form which is at once more comprehensive and more convenient for purposes of reference. We particularly appreciate the form adopted for shewing the life assurance revenue accounts of each of the Indian and non-Indian companies which shews at a glance not only how each company compares with others as regards a particular head but also shews how the result of the year under consideration compares with the corresponding figures of previous years relating to the same company.

Turning now to the subject matter of the returns we find that the progress of life assurance business in British India during the year 1917, was fairly satisfactory. The new sums assured by Indian companies under ordinary life assurance policies during the year under review shew a considerable increase, the total amount being nearly 224 lakhs as against 190 lakhs in each of the two previous years. In this connection one interesting fact may be noted. Endowment assurance policies constitute the most popular form of life assurance in India about 77 per cent of the total business of 224 lakhs during the year under review consisting of this kind of policy. This proportion of endowment policies to the total insurance policies issued by British companies is only about half of this. This clearly shews that endowment insurance policies are much more popular in India than they are in Great Britain. The reason perhaps is to be found in the peculiarities of Indian character and Indian economic conditions. In countries where the population is more energetic and enterprising and various industries flourish in a high degree life assurance is chiefly resorted to as a protection to the family against the contingency of *death*. The individual has confidence that as long as he lives he can manage somehow to earn a

decent living and insurance is not availed of to a large extent as a method of investment and laying by savings for which there are numerous other ways open. The Indian on the other hand is anxious to utilise life insurance as a method of laying by his savings and is anxious to secure the possibility of getting the insured sum during life time even by paying a considerable amount of extra premium.

The total sums assured including bonus additions, under ordinary life assurance policies issued by Indian companies have increased by over 5 per cent during the year and amount to over 24 crores of rupees. This figure is interesting as it works to less than a rupee per head of the population. It is true that this total of 24 crores does not include policies issued by non-Indian companies but it has to be remembered also that the policies issued by companies working in British India include a considerable number issued on behalf of inhabitants of Native states. In this view, the conclusion that the average amount of life insurance per head of population in India is less than a rupee seems to be well warranted. This conclusively shews how vast is the field that still remains to be worked by life insurance organizations working in India. In fact, it may be said that in India the operations of life insurance have not yet permeated to the masses of population except Mysore where the State is trying to carry the benefits of life insurance to the masses by opening a State Life Insurance Office in which even the poorest cultivator, artisan or labourer may take a small life policy under conditions suitable to men of his class, we know of no other part of India where any such attempt has been made. If life insurance is a blessing to the higher and middle-classes it is a far greater blessing to the poorer classes. Though the work done by the Life Insurance companies in India has been of considerable economic value from the point of view of welfare of the population, it has to

be admitted at the same time that their work has only touched the fringe of the population and that it has not yet extended to the classes who are most in need of the benefits of insurance.

One of the most beneficent results of the working of Indian Life Assurance Companies Act, 1912, is, as can be made out from the Report of the Government Actuary, the gradual extinction of unsound companies and the better and the more economic management of the sound ones. This is shewn by a gradual reduction since 1913 in the ratio of the total expenses to the life assurance premium income. This ratio steadily fell from 23·8 in 1913 to 20·2 in 1917. In the United Kingdom, however, the ratio of expenses to life insurance premium is only 13 per cent. The policy holders of insurance companies in India may, therefore, look forward to a further reduction in the ratio of expenditure, in years to come.

It is a matter of regret that the insurance returns of British India have to remain incomplete in many respects owing to a defect in the Indian Life Assurance Companies Act. Thus, neither the total sums assured remaining in force nor the total amount for which policies are issued each year in British India by all companies can be stated, as unfortunately particulars of this nature are not required to be submitted by the British companies and by some of the other companies which transact business both in the United Kingdom and in India. Why this should be so, it is difficult to understand. It is very necessary that the Act should be modified so as to require all companies doing business in India furnish statistics regarding the extent of business done by them in this country.

In his introductory note, the Actuary again explains, as he did last year, that the depreciation of securities is not such a serious blow to life insurance companies as many may imagine. In the first place the

income of most companies exceeds the outgoing and consequently there is no occasion for securities having to be realised immediately. In the second place, the depreciation of securities is accompanied by a considerable rise in the effective rate of interest which goes far to counterbalance the decrease in capital values at the time of an actuarial valuation of the financial position.

The Government Actuary brings to notice that whereas most of the Indian companies established during the last twenty-four years are proprietary companies with a share capital, the older ones are mostly mutual companies. As the Mutual companies generally have very small funds, Government are inclined to shew some concessions to them. Thus Government will be prepared to consider any application from an Indian Mutual company for permission to pay a deposit smaller than the full deposit prescribed in section 4 of the Life Act and will also permit them to employ as auditor the holder of a restricted certificate while the other companies are required to employ as auditors the holders of unrestricted certificates only. It is also pointed out that one or two of the existing life offices are called "Mutual Companies" though they have share capital and are proprietary in their nature. Such confusing nomenclatures should be avoided.

A few years ago, a very large number of Provident societies suggestive in their names of being ordinary Life Assurance companies were started in all parts of India. There were a very large number of unsound societies among them, and there is no doubt that the spread of life insurance in India was greatly hampered by the operations of these societies. Thanks to the operation of the Life Assurance Companies Act and the Provident Insurance Societies Act, the operations of unsound provident funds and life insurance societies have been controlled to a very great extent. About twelve years ago there were about 1,200 Provident insurance societies in India. Now only about forty-five

remain. The unsound ones worked on the principle of the dividing societies. At present there are two acts of the Government of India, one relating to the Life Insurance companies and the other to the Provident Insurance societies. A company is subject to the Life Act and not to the Provident Act if under insurances payable at the death or survivance of any one life, it undertakes either to pay sums which in the aggregate exceed Rs. 500 or receive premium which exceeds Rs. 25 in any one year or Rs. 250 altogether.

There are several remarks in the note of the Government Actuary relating to institutions within the Mysore State. The All India and Burma Provident Fund of Bangalore is one of the four Life Assurance companies in India which continue to issue policies on the dividing principle. Mr. Meikle is no admirer of schemes of dividing insurance. In fact, he says that this form of insurance is the curse of insurance enterprise in India. All companies which are doing insurance business on the dividing principle or which may feel inclined to undertake this kind of work will be well advised to read the sound advice given to them by Mr. Meikle in his note.

Of another Mysore concern, the Government Actuary writes in his note as follows:—

"..... This Company's head office is in the Native State of Mysore. The Mysore Government is, however, in no way concerned with the Company and by a notification dated the 23rd December 1914, published in the *Mysore Gazette*, it announced that the use of the words "Mysore Government" in the name of the Company did not mean that the Mysore Government authorised its formation or in any way supervised its business.

"This Mysore Company for about a year past has endeavoured to transact insurance business of the Dividing Society type in British India. By keeping its life assurance contracts within the limits prescribed for

Provident societies, it first of all escaped compliance with the Life Act and by only having canvassers working in British India and so restricting their powers, it endeavoured to escape compliance with the provisions of the Provident Insurance Societies Act. On being informed that this could not be done it has decided to issue policies which make it subject to the Life Act....."

Another matter to which attention is drawn by the Government Actuary in his note is the selection of Agents. He points out that the companies are responsible to a great extent for the action of their agents and it is therefore of the greatest importance that only men of unimpeachable integrity should be employed by companies to act as agents on their behalf. This is necessary in the interests of the companies themselves, of the policyholders and of the progress of life insurance work in India.

Life insurance is an economic necessity of modern society. It is as necessary in India, as in other parts of the world. In fact as the people of India are poorer than the people of other countries, the necessity for a system of life insurance suitable to the masses is greater in India than elsewhere. It is a remedy against many of the evils to which society is liable. It is an institution which makes a man happy and contented and makes his relation with others more cordial and friendly. It enables a man to feel relieved of burdens and moral responsibilities which would otherwise weigh heavily on him and make his life unhappy and miserable. It is one of the triumphs of modern economic organization which has already achieved far reaching results and promises to achieve far more in the future in respect of the individual, the family and the society as a whole. Now that the war has closed and India has once more resumed her journey in the path of economic progress, it is to be earnestly hoped that this useful department of work will not be lost sight of by those charged with the duty of fostering the material and moral advancement of the country.

REVIEW OF THE TRADE OF INDIA IN 1917-18.

MR. Findlay Shirras' Report reviewing India's trade in 1917-18, which has just been issued by the Department of Statistics, India, is a document which deserves to be, and doubtless will be, studied with every attention alike by the business world and economists generally as it points out roughly future developments and the lines on which progress in trade is likely to take. The Report begins by pointing out that "for the fourth year in succession the Review of the Trade of India has been written amid the tumult of a world at war. Three years ago few of us dreamt that India, being far distant from the titanic struggle in Europe, would have experienced the great changes that have taken place in her commerce and industry. In commerce the continuous demands on the part of the Allies stimulated the export of commodities of vital or national importance, and at the same time altered the direction of trade; in industry necessity was the mother of invention, and the war has been a great impetus to industrial development. The share of manufactured goods in the export trade of the year increased to 31 per cent from nearly 24 per cent, the pre-war average. Owing to the phenomenal shortage of ocean freight and the restrictions in the outflow of merchandise in various ways, India (which had held before the outbreak of war the second place in the Empire's trade, next only after the United Kingdom) gave pride of place to Canada." The value of the overseas trade in merchandise was nearly Rs. 393 crores as against Rs. 395 crores in the previous year and Rs. 370 crores, the pre-war average. In exports of merchandise there was a decrease of 1 per cent, while imports were approximately the same in value as in the preceding year. Prices have had a great effect, as was to be anticipated, in the value of the trade. Had

the prices of the previous year prevailed, the value of the import trade would have been Rs. 122 crores instead of Rs. 150 crores, and that of the export trade Rs. 216 crores instead of Rs. 233 crores. Import prices rose, as compared with the previous year, 23 per cent, while exports rose 8 per cent.

During the year India sent goods to the value of Rs. 127 crores to the United Kingdom and other parts of the British Empire and Rs. 90 crores to the Allies. The bulk of the exports to the United Kingdom and her Allies consisted of articles of national importance. The quantities exported of food grains especially wheat, barley, and gram, jute manufactures, tea, and tanned hides considerably increased as compared with the exports in the pre-war period. The total value of food grains exported amounted to nearly Rs. 54 crores as against Rs. 46 crores, the pre-war average, and of this amount wheat accounted for Rs. 19 crores. The export of jute manufactures was valued at approximately Rs. 43 crores as against Rs. 20 crores in the pre-war quinquennium, while tea was exported to the extent of Rs. 18 crores, the pre-war average being Rs. 13 crores, and tanned hides Rs. 5 crores as against only Rs. 1½ crores in the pre-war period. As the Review points out "War time prosperity has, so far as our industrial activities are concerned, continued to bring grist to the mill. The trade returns of the year are surprisingly good considering the restrictions prevailing upon exports, and the difficulties of freight and finance." This is well illustrated in the statement of Bank Clearings, which reflects the activities which the country continues to experience mainly, if not wholly, as an outcome of conditions in Europe. Company flotations similarly illustrate this industrial prosperity. Prices of securities and shares show a general increase so far as industrials are concerned, while there was a decrease in the market price of Government securities and Municipal debentures.

Of the detailed analysis of India's trade in 1917-18, it is difficult to write an adequate summary. In cotton piecegoods, India's largest import, there was a decrease in quantity coupled with a large increase in value. The share of the United Kingdom in grey goods decreased to 87·2 per cent from 98·8 per cent in the pre-war quinquennium, in coloured goods to 91·8 per cent from 93·5 per cent, while that of white goods increased slightly to 98·8 per cent from 98 per cent. Indian mills showed an increase in the production of finer varieties of cotton fabrics, particularly coloured goods, and also an increase in the production of high counts of yarn spun. Japan considerably increased her share in the imports of cotton piecegoods, the quantity imported from Japan in 1917-18 being thirty times that in the pre-war period. Next to cotton piecegoods sugar is India's largest import. The total imports of sugar were 7 per cent larger than those in the previous year and Java continued to be the principal source of supply. The review on the iron and steel import trade illustrates how great were the demands on the part of the Allies for the manufacture of iron and steel into munitions of war. The total imports were less by 79 per cent than the pre-war average. The value of the imports of railway plant and rolling-stock was only one-ninth of the pre-war quinquennial average. Kerosene oil was imported only to the extent of 31 million gallons as against 49 million gallons in the previous year and 67 million gallons, the average imports before the war. An interesting feature of the year's trade in mineral oil was the increase in the imports from Persia. In the imports of provisions, an interesting change in the direction of trade has taken place as Australia has increased her share in the imports of biscuits from 5 per cent during pre-war times to 52 per cent in 1917-18, and also increased her supplies of bacon and hams, cheese, canned and bottled provisions, jams and jellies. The United States was the

largest provider of condensed milk followed by the United Kingdom, Australia, and Holland. The quantity of brandy imported was 228,000 gallons and of whisky 656,000 gallons. The imports of beer were 1,858,000 gallons as against 2,586,000 gallons in the previous year. A very interesting feature of the trade in beer is that for the first time Japan took the lead, the United Kingdom having hitherto been the largest supplier. On account of the embargo on imports the number of motor cars decreased by 73 per cent, and the year, like its two predecessors, was the year of the American motor car in India.

In the export trade there were several interesting features which are dealt with in detail in the Review, and these can only receive passing mention here. The chief feature of the year was the large increase of 52 per cent in the value of food grains exported, a result of the unusually good monsoon which is the jugular vein of India's trade. Another feature of the export trade was the increase in the value of raw cotton exported by 18 per cent above that of the previous year. The exports of jute manufactures amounted to nearly 720,000 tons, valued at nearly Rs. 43 crores. In three years the jute mills of Bengal have shipped on Government account 1,073 millions of bags and 375 million yards of cloth. Another feature of the export trade was the large decrease in raw jute, seeds, and raw hides and skins. Raw and manufactured cotton was the chief export during the year as was jute in the two preceding years. The exports of tea were the highest on record—359 million lbs., or 35 per cent above the pre-war average. The exports to the United Kingdom were 37 per cent above the pre-war average and the direct shipments to the United States were nearly seven times those of 1916-17, and more than eight times the pre-war average. The effect of the war is writ large on every page of the Review connected with these exports.

In the direction of India's trade the effect of the war has been to increase the trade of India with other parts of the British Empire. The share of the British Empire in 1917-18 rose to 57 per cent from 53 per cent in the pre-war quinquennium. Trade with foreign countries decreased from 47 per cent to 43 per cent. The most interesting feature in regard to the direction of trade is the large increase in the trade with Japan and the United States. Mr. O'Connor, late Director-General of Statistics, wrote in the Review of Trade for 1888-89 regarding the trade of Japan that "Imports from Japan are quite trifling, averaging less than three lakhs annually in the last five years, and there are no indications of an increase unless the imports of copper should be resumed." When the long list of imports at the present time is examined, the progress in our trade with Japan cannot be termed other than phenomenal. In 1917-18 the total trade with Japan exceeded that with other countries except the United Kingdom and was valued at Rs. 52 crores. This was an increase of 400 per cent in imports and 103 per cent in exports over the pre-war average. The value of the trade with the United States had grown to twice what it was in the pre-war period, being second only to that with Japan. Half of the import trade with the United States was made up of iron, steel, and mineral oil, while the trade with Japan was chiefly in the import of cotton manufactures, matches, metals, silk manufactures, and glassware and in the export of raw cotton.

An interesting feature noted on the frontier trade of India is the increase in importance of the Shan States in the production of lead and silver. Owing to the large output of the mines near Namtu the production of refined silver in two years has risen from *nil* to over 1½ million ounces, and the production of refined lead from nearly 7,000 tons to 17,000 tons. In the rail and riverborne trade the statistics of the movements of piecegoods are of considerable interest as these were 60

per cent below those of the pre-war year. Of the consuming provinces Bengal and Madras showed a decrease of 42 per cent each, the United Provinces 28 per cent, and the Punjab 14 per cent. In the net imports of kerosene oil by rail and river, Bengal showed a decrease of 30 per cent, Madras 17 per cent, Bihar and Orissa 14 per cent, the United Provinces 14 per cent, Bombay 7 per cent, and the Punjab 17 per cent. Railway earnings which are always a valuable index to the general movement of the inland trade of the year were 20 per cent above those of the pre-war year and 8 per cent above the previous year.

One of the most interesting features, if not the most interesting, is that dealing with the excess of exports over imports, and the liquidation of this large trade balance which India has enjoyed in recent years mainly on account of the insistent demand on the part of the Allies for her products. The gap between exports and imports of merchandise was £61 millions sterling, as against £63 millions in 1916-17, and £52 millions the pre-war average. After making allowance for the various items the Director of Statistics estimates that net balance was £11,590,000 as against £30,395,000 in 1916-17. A caveat, however, is added that "it must suffice to affirm at the risk of wearying the reader with so many repetitions on this subject that there are more things in regard to India's balance of trade than are dreamt of in the philosophy of the Indian trade returns." The increase in the net imports of treasure was mainly due to large imports of gold, and the statistics of treasure show that India has been absorbing considerable amounts of the precious metals in spite of the war. The absorption of gold during the five years ending March 1918, amounted to more than one-half of the world's yearly production and the net imports of silver in the same period nearly twice the world's annual production.

STATE CREDIT AND BANKING.

BY THE EDITOR.

MR. Robert Benson deserves praise for the illuminating book he has produced on *State Credit and Banking* (Messrs. Macmillan & Co., 5 sh. net). Originally printed for private circulation, it has been now re-issued to the public as the demand for copies was continuous and persistent. The great value of the book is that it deals boldly with the question of financial facilities and how to find the money requisite for reconstruction purposes. The main issue he grapples with has to do with liquidity of the vast private capital locked up in War Loans. How to liquefy this vast capital? That is the central question he attacks in this book. His suggestion, very briefly put, is that the Banks should establish a Central Institution to make advances on War Loans and that the State guarantee such advances. To those who have invested their money in War Loans, the suggestion ought to prove a welcome one. To those who wish to have capital for reconstruction work, it ought to be equally worth serious consideration. The importance of the suggestion put forward by Mr. Benson will be realized when we remember that over a third, if not quite a half, of the country's wealth is now represented by Government securities, and that any attempt to sell them to the extent required would be impossible without producing a disastrous fall. This by itself is a strong reason why a Central Institution of the kind he mentions and from which holders of war stocks would be easily able to borrow on them is necessary. Mr. Benson foresees the gravest consequences to Britain's fair name and industry, unless Government adopts a policy which prevents any serious slump in its own securities. His proposal, which is set out with a wealth of detail which is all his own, is designed to prevent this disaster.

He says: "Freedom and not restriction of the greatest of all markets—the money market—is indispensable if we are to pay our debts, rehabilitate the pound sterling, and re-establish the position of London as the Clearing House of the World."

We do not think that Mr. Benson's position can be misunderstood after what we have stated above. We need not agree with all that he says—we take it that he does not expect that either—but his main proposal is worth enlarging upon, if for nothing else, at least to show how closely he argues his position. For a financial writer, Mr. Benson is skilfully argumentative and even dryly caustic on occasions. His chapters on German banking and reconstruction in America after the Civil War (1861-65) and the Federal Reserve Banking System of 1913 and the experience of France will repay perusal by those interested in banking and credit matters generally.

We would now hark back a little and refer to Mr. Benson's proposal for a Central Banking Institution. Mr. Benson thinks that besides the Bank of England, which is the Bank of the British Empire to regulate the exchanges and the international values of pounds sterling, another Central Institution is required to do for the market in Government securities what the Bank of England does for the Bill Market, *i. e.*, to make our premier security liquid and available as collateral for reconstruction finance, and a larger potentiality of credit for productive purposes. He thinks that the State should come in to guarantee, in case of need, the *liquidity* of loans made by such Central Institution on Government securities, and in consideration of its guarantee should participate in the profits as in the case of the Reichsbank, and as the American Government does in the case of the Federal Reserve Bank. The business of deciding to whom to lend to, for what object, for how long and at what rate, is an art needing trained judgment such

as cannot be got under Government Departments. In a word, he pleads for a further step in the co-operation of State credit without sacrificing the individualism of British Banking. Mr. Benson does well, we think, in disarming his would-be critics by a few words which deserve to be quoted here, for they cannot be better stated than in his own words.

He says: "To some, such a proposal may seem revolutionary, but in fact it is more open to the criticism that it does not go far enough; at least it does not go as far as the German or American banking systems; in both of which bills or "self-liquidating" paper form part of the basis upon which legal tender Notes are issuable. For, while it broadens the basis of credit, it limits it to gold plus Government Securities. It is an attempt to formulate a practicable course under existing conditions. It does not attempt to create a potential supply of pounds sterling comparable to the supply of American Dollars or German Marks, but it preserves the convertibility of our currency under 4 and 5 Geo. V. Ch. 14 and it does not shirk our existing liabilities to pay gold on outstanding options.

"The idea that we pay in gold is deeply rooted in the public mind. It is somehow connected with the idea of national honesty as well as national solvency, and talk of the suspension of the Bank Act scares people as if it were repudiation as well as bankruptcy. But Americans and Canadians who are habituated to paper know that payments are really made in goods and services, while Continental critics regard our claim to pay in gold as a mark of British hypocrisy. The experience of the War may enlighten the public and enable them to realise that the Bank Act is practically suspended already; that the gold standard did not cease to exist when, or because, currency notes were substituted for gold in circulation, but that it really began to yield to the sterling standard when credit was invented and gold

ceased to pass from hand to hand at every transaction. The public may come to understand that, in spite of our exportable gold currency, British banking adapted itself to conditions so that what was formerly treated as a measure of value gradually became no more than one among various *media* of Exchange, and that this was an international evolution. They may then go on to see the excellence of Peel's standard coupled with our cheque system really rested on elasticity rather than on restriction to gold; and that restriction to gold was its weakness and a relic of barter. Once again we are up against a condition and not a theory. Perhaps public opinion may now be willing to acquiesce in the broadening of the basis of credit with the assistance of the State.

"What then is our standard? It is, I submit, the pound sterling. But what is a pound? Is it abstract or concrete? Vegetable or mineral? Paper or metal? Some say it is one, and some the other, when in truth it is neither, or rather it is both, *i.e.*, it is a relation between gold and all exchangeable things. It is a relation, which, as a banking system, becomes more perfect, tends to merge into a free relation of all exchangeable things, gold included, to each other. The standard is the residual product of those relations. One might say that its stability is conditioned by instability; and that its honour, rooted in dishonour, stands. *La monnaie à l'état le plus parfait est de papier, i.e.*, Treasury notes, under safeguards such as we have got already."

The scheme he proposes may now be briefly described. The scheme is for a Central Institution to provide for after-war development by enabling holders of Government securities to borrow thereon and is as follows:—

- (a) Capital, say, £100,000 of which 5 per cent to be called up leaving the balance as a reserve liability.
- (b) The capital to be held by the Clearing Banks in proportion to

their deposits or as may be agreed.

(c) The object is to be ready always to advance money on British Government Securities.

(d) Borrowers should maintain a margin of (say) 10 per cent; whether this margin should consist of British Government Securities only, or include other good securities, such as Colonials, is open to discussion.

(e) The effect of the working of the Institution would be that it would become indebted to the clearing banks for the amount of their advances.

(f) The State would guarantee the banks' advances in consideration of a share in the profits, and any bank must have the right in case

of emergency to demand currency from the State upon the amount of its advance to the Institution.

(g) The advantage to the Banks would be that not only would they be amply secured against loss, but as their advances to the Central Institution would be liquid, their proportion of liquid assets to deposit liabilities would be increased.

(h) The rate of interest charged by the Banks to the Institution should be lower than the rate charged by the Institution. The difference would be the profit to the Institution, divisible between the Banks and the State.

To show the effect of the working of the Central Institution, suppose that the Bank's position were as follows:—

Deposits	£ 2,000,000,000	...	Reserves (till money) say	...	£ 100,000,000
			Balances with Bank of England	...	300,000,000
					400,000,000 *
			Loans, Investments &c.	...	1,600,000,000
	<u>2,000,000,000</u>				<u>2,000,000,000</u>

* or 20 per cent quick assets against deposit liabilities.

Suppose that the advances of the Institution to customers amounted to £ 1,000,000,000; the banks' deposits and loans might rise by £ 1,000,000,000 each. But as the loans would represent advances by the Banks to the Institution guaranteed by the State in case of emergency, they would be liquid. The balance sheet of the Banks would therefore be—

Deposits	£ 3,000,000,000	...	Reserves (till money) say	...	£ 100,000,000	£
			Balances with Bank of England	...	300,000,000	
			Advances to Central Institution	...	1,000,000,000	
						1,400,000,000 *
			Loans, Investments, &c.	...		1,600,000,000
	<u>3,000,000,000</u>					<u>3,000,000,000</u>

* or 46½ quick assets against deposit liabilities,

Possibly the Banks might require to increase their till-money up to the pre-existing proportion, or 5 per cent of their deposits; but as they would cease to receive interest on the amount taken out in currency, there would be a safeguard against their taking out more currency than was actually required to maintain their till-money. Such

currency would not be in circulation, and in the above balance sheet would increase the till-money by £ 50,000,000 and decrease the amount of advances to the Central Institution by a like amount. As to the profit divisible between the State and the Banks, if the Institution charged for its advances ½ per cent above the rate it paid to the above

banks, the gross profit on advances amounting to (say) £ 1,000,000,000 would be £ 5,000,000 per annum and the Banks would receive their proportion of this profit as shareholders of the Institution. The position of the Banks would be very much stronger in emergencies in so far as they would be entitled to demand currency for the balance of their advances to the Institution. As to what constitutes an emergency, a practical solution would be to allow the banks take out such currency as would be required to make up their cash reserves to the normal percentage of their deposits. But a much more stringent definition, which would limit the right to draw currency notes to times of financial crisis, might be much more desirable. It must be a paramount object to conserve the value of the pound sterling. Thus the question of the Bank Charter Act comes in, and its suitability to the conditions of to-day when we must be prepared to regulate our finance as if Great Britain was a debtor country and not a creditor as it was in Sir Robert Peel's time. Mr. Benson does not say that we shall be, but some of our loans to Allies may (he thinks) prove irrecoverable (or temporarily so) and make us in effect a debtor country for the time being, because we shall owe more to America, Holland, Scandinavia, and Switzerland than our Allies will effectively owe to us. The First great critic of the Bank Charter Act was Sir Robert Peel himself, in his letter from Windsor Castle dated 4th June 1844. He admitted the contention of the Governor of the Bank and of Mr. Bosanquet and others that his Act was liable to be too rigid, as in fact it proved to be in 1847, when he himself sanctioned its suspension. He preferred to err on the side of over-rigidity, saying that he expected men able to deal with emergencies to arise, along with the emergencies of the future. He was right, for in 1857 and 1866, when solvent debtors were on the brink of ruin because they could not get money even at 10 per

cent, men arose again to demand suspension; again in 1890 and 1907 we had to fall back on the support of the Bank of France: and yet again in 1914 on the outbreak of War men arose to devise currency notes, for we had not got them ready printed as the Germans had. Later on men were found to deal with the emergency of the American Exchange and finally, in accord with our Allies, the United States, to hold it steady. Since Sir Robert's day the cable has been invented and prices have become international. We are now in the position of having had to entrust the regulation and control of prices and the exchanges, not as Sir Robert Peel said "to individual caution and discretion", but to the State, to manage from day to day until our position as a creditor country is beyond a doubt. Clearing Banks' Deposits have increased from 1,033,000,000 on 31st September 1913, to £ 1,703,000,000 on 31st December 1917, and may amount to over £ 2,000,000,000 by the end of the War. There may be no difficulty about meeting the demand on the part of the Bill Market, nor yet for short loans on quick-turnover collateral;—except in so far as they may mean withdrawals of gold. The difficulty is more likely to arise over the demand for longer loans which are the subject of financial, as distinguished from commercial, banking and which are not suitable employment for deposits. The public has plenty of assets to meet the demands of reconstruction, but they are largely locked up as fixed capital, or in War Loans. Hence the need of a sort of pawnshop for Government Securities (a) liquefy War Loans, (b) to assist banks to unload their investments in War Loans, (c) to create a broad and free market and maintain the credit of our premier security. If people find they can't sell, they all want to sell. But if they can sell, or borrow freely, many of them won't want to sell; every fall in price tends to bring in fresh buyers, and to establish a market before confidence is impaired.

So far for the scheme itself, which we have given, as far as possible, in Mr. Benson's own words. Now, as to possible objections against it. Mr. Benson thinks that at least five main criticisms may be anticipated, against his scheme. These are, in his opinion, (1) Will it cause further rise of prices, *i.e.*, inflation? (2) Will it stand the strain of a foreign drain upon our gold reserves? (3) Would it in effect mean abandoning our free market for gold? (4) Is it required? May we not find ourselves with too much money after the war instead of too little? and (5) Would it contribute to speculation, honeycombed credit, and panic? He meets each of these possible objections in a perfectly straightforward manner. We can only indicate here his answers to these objections. He inclines to the view that the first objection is a groundless one. If inflation exists at present, he says, it will be followed by deflation after war (the book was written during the war), which has its own peculiar difficulties and dangers. To the Banks in particular it means an increase in the proportion of their invested assets to their quick liabilities, unless they can unload those investments, or borrow on them in case of need. To producers and distributors, falling prices mean readjustment of everybody's share in the price of the product, and unless costs can be readjusted *pari passu*, lock-outs and strikes follow, and loss. Any power of graduating the inevitable fall of prices which will come as peace production overtakes war consumption, is to the good. Good banking largely consists in keeping things moving on, so as to avoid congested spots and sudden breaks. Incidentally a banker has to teach some customers to sell and repent. As Mr. Benson rightly observes, many of our after-war difficulties can be solved only in the course of experiment. As regards the protection of the Gold Reserve, Mr. Benson states that the respective gold holdings of our neutral creditors, Spain, Hol-

land, Scandinavia, and Switzerland in their State Banks have increased from £51,100,000 in December, 1913, to £190,800,000 in June 1918, while the gold reserves of the American Federal Reserve Banks have increased from £46,500,000 in December 1914, to £380,000,000 on 31st May 1918, without counting gold in the United States Treasury and in circulation. Suppose, he asks, our floating debts at call or short notice were to amount to £250,000,000 at the end of the War, will the money be wanted on the nail in gold, or will it, or a proportion of it, be kept in London or invested in England till it can be taken out in goods? Probably the latter, Mr. Benson thinks, if our neutral creditors see that we have faced the situation and that, if they want gold, they can have it. The war has proved, he adds, the futility of trying to meet adverse balance of trade by gold: no belligerent except perhaps America will have enough of it to pay in gold, and some creditors will not want more gold. In short, is any drain of gold probable except perhaps to America? America's interest will be to carry her debtors till she can be paid in goods and services and not to upset their finance. A good banker does not begin collecting debts by forcing customers to liquidate. As to Germany she is most unlikely to be able to command gold; she is more likely to have to part with it in order to get raw materials. As to the third possible objection, whether the scheme would in effect mean the abandoning of our free market for gold, Mr. Benson thinks that there will not be any free market for gold for sometime after the War. Government control can only be gradually relaxed over exports and imports, issues of capital, foreign exchanges and gold movements. Possibly gold will move about from centre to centre much less than heretofore, especially within the Empire, and the Anglo-Saxon world. He thinks also that it is possible to have a British Empire controlled rate of exchange. He further doubts whether we shall be able to allow a return

to a gold currency for sometime to come, and whenever we can afford it (he adds) the utility of gold will be greater in the Bank of England in connection with exchanges, or for window dressing purposes in connection with Currency Notes than in our pockets. By the time we can afford it, the public may have concluded that a sterling standard is best, combined with a paper currency, *i.e.*, Currency Notes, convertible to prevent any possibility of over issue, as they are now.

In answering the next objection, whether such a scheme as the proposed one is at all necessary, Mr. Benson fully examines the question whether we shall have too much money or too little after the War. Some might argue, he says, that considering that there are already £ 320,000,000 legal tender notes outstanding, and that deposits may easily amount to £ 2,000,000,000 by the end of the war, there will be too much money about instead of too little. This argument, he holds, is fallacious. One cause of the expansion of Bank deposits is the increased investment by the Banks in Treasury Bills, Exchequer Bonds, War Bonds, etc., including "Ways and Means advances." When the Government begins to repay Treasury Bills, etc., raising the money either by taxation or by issue of war loans placed with investors, deposits will automatically contract as the Government repays the investments held by the Banks. Another cause of expansion of Deposits is the rise in prices of commodities which necessitated larger advances to finance trade. When prices of commodities begin to fall deposits will also begin to contract. Lastly, in the happy event of there being too much money about, people would not have to go to the proposed Central Institution. It would be a safeguard in reserve. Credit is not created unless it is required: it is not a supply forced into circulation. There is no equation between the potential supply of credit and the actual demand. The British Banking System, moreover, has no potential supply of credit as

the American one has under the Federal Reserve System; on the contrary, the contraction of deposits is possible as and when commodities fall to normal prices. By that time every manufacturer and merchant who carries his stock by means of bills or loans from his bankers may have to borrow only half as much as he is borrowing to-day and bills and cheques may be drawn for only half the war-time figures. In so far as expansion of loans and deposits have been an effect of rise of prices, so fall of prices will automatically be followed by construction of loans and deposits. Further, the increase in Banks' investments from £223,000,000 on 31st December 1913, to £529,000,000 on 31st December 1917, or from 20.2 to 28.5 of their deposits, is no true correlation of factors which rise and fall together. As deposits run down, the proportion of investments will bulk larger and impair liquidity; Banks will want to unload at the same time as others whose money is temporarily invested in Government securities, and if nothing is done to prevent it there will be a collapse, for the price of Government stock depends upon the market and whether money is surely obtainable to carry it for a probable profit until it can be distributed. Finally in regard to the objection whether the proposed Central Institution would contribute to speculation and panic, Mr. Benson first remarks that inflation of currency is not so difficult to guard against as inflation of credit. If credit, as created by the proposed Institution, is used only for the production of real goods and the performance of real service, *i.e.*, to support genuine productive enterprises not speculations, there will, he thinks, be no inflation. As to the risks of speculation getting beyond control and creating fuel for panic, that is always with us, and the remedy is largely a question of good banking. Mr. Benson argues that man will never be quite master of his own credit machine; but, however this may be, there will have to be

more control over Stock Exchange quotations and issues henceforward, also over the direction of investment and customers' operations. More care will have to be taken to see that the working man and the little public generally do not lose their savings in the wrong sort of speculations. We have got, he says, to mend our haphazard ways and control the activities of the Company promoter, whose object is to trade in watered stocks, unenforceable securities, gambles in mining or other counters. Employment and production are the first conditions of national solvency. There is something to be learnt, he adds, from the German policy of conserving national savings for productive purposes through the great Banks, each with its group of smaller banks and their respective customers. Mr. Benson's chapter on the Reichsbank, the Darlehenskassen, the Joint-stock Banks, and the Stock Exchanges deals with this aspect of German organization and is worth of close study by every one interested in banking and finance.

We have indicated above Mr. Benson's general position and how he buttresses it must also be clear to our readers. They will find his book a most suggestive one, whether from the theoretical or the practical point of view. To it we should refer those who want to have a clear idea of what he means when he concludes the last chapter of his book thus:—"Freedom and not restriction of the greatest of all markets—the money market,—is indispensable if we are to pay our debts, rehabilitate the pound sterling, and re-establish the position of London as the Clearing House of the world."

ECONOMICS IN THE WEST.

Industrial Commission's Report.

London, December 11, 1918.—The report of the Indian Industrial Commission which has just been made public here contains so much that is interesting and suggestive that it is unfortunate its issue should have coincided with the height of the general election campaign. Notoriously the British public will not give attention to two subjects at a time and in the hurly burly of the contest I am afraid that the highly important proposals of the Commission will escape the attention they deserve. Nevertheless, there is a sufficiently alert section of the people to read the excellent summaries of the report published in the papers and to grasp their significance from the standpoint of India's future. They especially realise what a revolution in policy the report foreshadows. Gone are the days of *laissez faire* when it was nobody's business to see that India was industrially equipped for the world competition which is before her as one of the greatest producing areas in the universe. No longer is the Government to stand aside while peaceful penetrators are monopolising her raw material presently to return it to her in the form of manufactured goods for which she has to pay a high price. There is, if I read the report aright, to be a new era in which Indian industries are to be fostered and encouraged by financial and technical assistance, and the Government is to see that wherever possible India's needs for manufactured supplies for official purposes are to be satisfied on the spot. In this programme we have a revival of the policy which was brought forward during Lord Ripon's administration. But the idea underlying the existing proposals is much more practical as it provides for the setting up of Indian industries as well as for the sale of their output.

Not the least satisfactory feature of the report is the provision made for the technical

instruction of the masses by peripatetic demonstrations. Conservative as the Indian villager's mind is it is sufficiently progressive to grasp the value of appliances and operations which clearly tend to his material advantage. Even labour-saving devices will make an appeal to him where they are not too complicated or costly. The truth is that India like the rest of the world is changing in these momentous times. Less readily, perhaps, than some other countries but not less surely she is advancing towards the light of the new civilisation in which science will take a prominent place. I entertain little doubt myself from my knowledge of Indian life that if the Government does its duty by this report that the position of Indian industry in a few years will be vastly different from what it is to-day. But it would be idle to expect that the transformation is to be effected by the mere waving of the official wand. As the Government attitude has changed towards industrial trade so must that of the people and especially of what, to use a popular phrase of the day, is called the *intelligentsia*. Education of the higher type must no longer be so largely conferred to producing officials and lawyers. It must have quite as much to do with training men who will fit to be future Captains of Industry and worthy transmitters of the ancient tradition which made Indian manufacturing art second to none in the world. Some decades since the popular cry in the centres of Indian thought was "India needs more Ripons:" to-day it might very well be "India needs more Tatas." Examples such as that set by the lamented pioneer of the great steel undertaking are of inestimable value.

THE VALUE OF PROPAGANDA.

We hear a great deal about the value of State propaganda in these days and I would wish that the Indian Government authorities were more alive to the importance of keeping before the British people the resources

and industrial potentialities of India. The ignorance here as to what India has done and is doing is really astonishing. When I chanced to mention to a friend of great intelligence and widely informed but untravelled the fact that India's steel industry had supplied the whole of the rails for the great network of railways in Mesopotamia he was astonished. Equally it was news to him that Bombay was supplied with power and lighting from a hydro-electrical installation deriving its energy from the Western Ghats sixty miles away. He, I believe, is typical of the average home staying Englishman. He is ready and even eager to be interested in India, but he has few means of ascertaining in a direct way the facts which are patent enough to all who are acquainted with the country. The Society of Arts through the medium of its illustrated lectures does really splendid service in extending knowledge of Indian developments. But it appeals to the select few, mainly to those who have a pre-knowledge of India and are intimately acquainted with all the leading facts concerning her institutions. What is needed is a direct popular appeal made through the same agencies as other parts of the Empire freely employ. At the present time alone among the overseas dominions and territories in the Imperial constellation India has no shop window in London to tell the passer by in language which the most ignorant could understand the character of her resources. Yet what possibilities there are here of bringing our modern democracy into touch with the great problems of Indian Government and the character of Indian commerce! I think I can almost see the horrified look which will pass over many official faces when they read the suggestion that India should descend to window dressing to make herself known. But those who decry the employment of the arts of propaganda in the interests of Government are behind the age. For good or ill popular propaganda has come

to stay and no administration, however dignified it may be, can afford to neglect it.

In writing of the value of propaganda I am reminded that within the past few days there has been issued the report of the Civil Aerial Transport Committee in which a strong recommendation is made that steps should immediately be taken under official auspices "to establish a system of propaganda throughout the Empire in order to convince the whole nation of the vast importance and possibilities of aerial transport and to familiarise the Governments and the local authorities with the subject." Here we have a definite proposal formally made for the employment of popular methods, and I do not doubt that it will be acted upon. Sweet, indeed, are the uses of advertisement! But, of course, the Civil Aerial Transport Committee's report only dealt with propaganda as an incident in the examination of a great question. Its main conclusions deal with aerial navigation in its manifold aspects and attempt an elucidation of some of the difficulties with which the establishment of a civil aerial system is confronted. One of its suggestions is that there should be uniformity in the air laws of the Empire. They are also strong in their recommendation of a co-ordinated effort to establish suitable landing grounds along possible routes. In regard to oversea traffic the Committee point out the great suitability of India and the dominions as fields for the development of civil aeronautics. In countries of magnificent distances such as Canada, Australia and India, and notably also in Africa, they would have remarkable scope as a means of ordinary travel and transport, and they would, besides, be of high value for purposes of exploitation and survey. Whether the new aerial service should be under private or State auspices is a matter which the Committee do not venture to trench upon. But they strongly urge that the Government should without delay come to a decision on the point. The whole report makes interesting

reading and it should soon be followed up by official action. Already other countries are moving in the direction of the establishment of regular aerial services. Even Germany, despite her broken condition, is in the field with a combined Zippelin and aeroplane scheme of transport.

THE FUTURE OF BRITISH TRADE.

What is to be the future of British trade? Many answers to the question are being given, but I have read none which is more instructive than that given recently in a Sunday paper by Mr. W. G. Faulkner. The writer points out at the beginning of his article that the trade boom is an inevitable corollary of a great war. It was so in the case of the Napoleonic wars after which our industrial system found its opportunity. After the Civil War the United States found itself industrially, and it was in the years immediately following the Franco-German War of 1870-71, that modern Germany was founded. Admittedly there will be a great opportunity offered and it rests with our working men, according to Mr. Faulkner, whether it is taken. If pre-war conditions are reproduced the prospect is not an encouraging one. Our workmen then produced per man per annum £187 worth of goods against £517 recorded in the case of the American working man. The war, however, has revealed to such an extent the advantages of mass production on scientific lines as to forbid the idea that we can ever return to the state of things obtaining before the war. For example, "at the beginning of the war a London Factory Manager hesitated about pledging himself to produce weekly 10,000 finished parts of an appliance. He revolutionised his methods of production and 250,000 finished parts of the appliance were sent out weekly by his factory." Another interesting fact worth noting is that in spite of shortage of labour we have doubled our output of steel increasing the manufacture from 7,000,000 tons a year to 14,000,000 tons. Mr. Faulkner's conclusion is that capitalist and worker must go with the flood which is sweeping away age worn methods. New occasions teach new duties; everything is becoming new. "We have spent

£10,000,000,000 on the war. We have now to consider how much we shall spend on peace. We could spend another £1,000,000,000 in developing the productivity of all our industries, sure that it could return rich dividends to every class in the community in greater purchasing power not only of the productions of our own country but of those of other countries."

It is being made clear that the trouble that lies ahead for British industry is not solely in the domain of labour. Employers everywhere are showing a restiveness against Government control. The necessity of official supervision during war is admitted, but it is boldly claimed that the experiences gained during the past four years show how completely unsuited to successful business is official direction. At the first general meeting of the British Federation of Iron, Steel, Tinplate and Metal merchants recently held great stress was laid on this point by the various speakers. The Chairman declared that a continuance of the control "would be disastrous to trade." Another speaker observed that "if this country was to be dependent for its vital necessities on some permanent official of the Board of Trade then its days were numbered." Finally, Sir Johnstone Wallace the Chairman of the Federation asserted that "if there was to be a continuance of the hampering methods which they had experienced, there was a sorry day ahead for British Trade." Unanimity of sentiment could hardly go further than in these utterances: and that the speakers voice the opinions of the community at large I entertain no doubt. Yet that the shackles will be speedily removed from industry is problematical. Labour is clamouring not for less but for more official control of industry. In my own constituency one of the candidates who is appealing for the suffrages of labour demands a system of National workshops. The poor man has probably never read the dire results which followed from national workshops in France in 1848. But it is the kind of stuff that tickles the ears of the groundlings and until the general election is over and labour finds its place, which I think will be at the bottom of the poll, we shall not find the Government anxious to relax its control of the industrial machine.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

The World's Greatest Mining Enterprise.

Washington, D.C., U.S.A., 13th Jan. 1919.—Speaking in terms of mere bigness, what is the greatest engineering enterprise in the world? The Panama Canal? Guess again. The subway system of Greater New York? No.

The greatest engineering enterprise ever known in the world is in the state of Utah, in the north-western section of the United States. It is a copper mine in Bingham Canyon—the largest ore producer of any metal mine in the world, yielding 150,000,000 pounds of metallic copper annually.

All the gold mines of the witwatersrand in South Africa put together have not developed so large an ore body. Nor has the biggest of all the enormous iron mines of the famous Mesaba Range brought so vast an ore body into view.

Whole mountains on both sides of Bingham Canyon are terraced from top to bottom with the workings of this wonderful copper mine. The terraces are like so many shelves running around the mountains, and are designated by letters, from "A" at the bottom level to "W" at the top.

Roads of only four per cent grade enable locomotives to draw trains of ore cars from the bottom to the top. Steam shovels scoop up the blasted rock and load it aboard the cars, which carry it to the stamp mills, where it is smashed to powder as a preliminary to the extraction of the copper.

The rock is granite. If you were to examine a piece of it you would not suspect that it contained copper. As a matter of fact, it holds an average of less than one and a half per cent of that metal—in other words, not so much as thirty pounds to the short ton of ore. The ore is of such low

grade that the mining engineer of a couple of decades back would have regarded it as absolutely hopeless to bother with.

But it happened that fifteen years ago an enterprising person named Daniel C. Jackling came along and looked over those mountains. He made up his mind that, if operations were undertaken on a sufficiently large scale, the ore deposits could be profitably worked. Here, in fact, was the vital point upon which success depended. It is the bigness of this engineering enterprise that has made it pay, the cost of handling each ton of ore and extracting the copper from it being thereby reduced to a minimum.

The copper is separated from the powdered rock by at least three methods. One of these is the utilization of gravity, the metal being heavier than the rock particles. Another involves the use of acids to dissolve the copper.

Next after gold and silver, copper is to us the most interesting of all the metals. Fresh and free of corrosion (as seen in a newly minted coin) it is really more beautiful than gold, having a more colorful and brilliant lustre. It is incomparably more useful than gold, serving as it does a vast number of employments for which there is no satisfactory substitute.

A LABORATORY ON WHEELS.

While protected from permanent loss through delivery of bad rails by the steel manufacturers, a railroad, it has been found, may suffer serious temporary embarrassment from the necessity for rejecting and returning a considerable part of a rush order which does not come up to the mark. One road in the United States has met this situation quite successfully by taking the whole onus of testing the rails off the railmaker and placing this responsibility upon its own shoulders. A traveling testing plant has been installed by placing all the necessary

equipment in a standard passenger coach, and this runs about the lines from place to place, dropping in upon the various rail-makers and testing their raw materials and finished product on the spot. The testing plant comprises a very complete, chemical outfit, as well as standard apparatus for physical tests of metals. This rolling laboratory really protects the steel company quite as much as it does the railroad, by insuring the former against using up its valuable labor on rails that will be rejected by the buyer.

RAILWAY CARS MOUNT GRAIN-UNLOADING EQUIPMENT.

Because of the necessity, during the war, of unloading ships at whatever ports they might enter, a novel, portable, pneumatic grain-unloading equipment was developed in the United States, and placed in use shortly before the conclusion of fighting. Its principle is quite familiar, but its arrangement is quite another thing. The plant is mounted on two typical railroad cars, and is designed to be despatched from point to point by rail, as needed. Its purpose is to facilitate the unloading of grain at ports that lack suitable facilities, especially those in Europe. The grain is sucked from the ship through an adjustable nozzle into the transport line, which consists of 12-foot lengths of pipe joined together by special couplings. A series of trestles supports the artery between the cars and the edge of the dock, while at different points it is fitted with ball joints to permit changes in position and alignment.

One of the cars is known as the filter truck. It mounts the receiving chamber, into the bottom of which the grain first falls. There the grain enters a discharger, consisting of a bucket wheel rotating within a close fitting casing, and is fed to a chute that drops it on a band conveyor delivering into the hopper of an elevator at one end of the car. The latter carries it to the dock's

weighing truck, which weighs and sacks it. Triple filters, consisting of nests of closely-woven canvas tubes, are also mounted on this car. Air, in passing to the blower must traverse these strainers and be freed of all dust and foreign particles. The accumulated dirt is trapped within the tubes, from which it is readily removed for weighing, when this is necessary in order to check the weights given in invoices.

The second car mounts the rotary blower, which is driven by an 85-horse-power motor that also actuates the machinery on the first truck. The maximum capacity of the plant is about 35 tons an hour when conveying from a distance of about 100 feet. The fuel consumption is stated to be seven gallons of gasoline an hour.

PORTABLE PHONES FOR EMERGENCY USE.

For emergency purposes many American telephone companies are adding to their equipment motor vans in which are installed switchboards and other apparatus necessary for a telephone exchange equal to the needs of a city or community of 25,000 people. When a fire or other catastrophe puts a local exchange out of commission, one or more of these trucks is rushed to the scene and telephone service is quickly restored, it being only necessary to connect up with the trunk lines. In cases where fire has destroyed an entire town outfits of this character have been invaluable in putting the distressed community in touch with the outside world. Portable exchanges in use in France are said to have suggested the idea to American telephone engineers.

ELECTRIC WATER HEATER USES WATER AS RESISTOR.

Probably the simplest form of electric heater for use in heating small quantities of water consists of two conducting surfaces placed at a fixed distance from each other in the water, the current then flowing directly through the water from one plate to

the other. The water is heated by its own resistance to the passage of the current. This method, it is stated, will not work with distilled water, as practically no current will flow through perfectly pure water. Ordinary drinking water, however, contains enough mineral matter in solution to permit the use of this principle in a heater. A convenient form consists of two brass tubes, one inside of the other, separated by two rubber washers, which have notches or holes made in them, to permit the water to circulate freely between them. One wire is soldered to one end of the inner tube and the other wire to the opposite end of the outer tube.

The heater of ordinary size and dimensions will not take more than a few amperes at 110 volts in ordinary water. It should not, of course, be used with sea water or other water containing such mineral matter, except on a much lower voltage. In any case, care should be taken that the circuit is properly protected by a fuse before the heater is inserted in the vessel of water.

MODEL PLANT FOR STORING VEGETABLE OIL.

At San Francisco, in the State of California, special facilities have been provided for handling vegetable oil, which is now being shipped in great quantities from the countries of the Orient for use in a variety of food products, soap, etc. In the year 1918, it is estimated that from 250,000 to 300,000 tons of this material—most of it cocoanut oil—have passed through the Golden Gate into the United States.

One of the new plants for receiving this oil is equipped with a number of immense steel tanks into which the product, after being heated, is pumped direct from the ocean vessels which carried it, and through an 1800-foot pipe line. When practically all the cargo has been forced through the pipe, water is injected to clean it out before the oil hardens. The mixture of oil and water is discharged into a special tank, from

which the water, on settling to the bottom, is drawn off while the oil is transferred to another tank. A special telephone line enables a watcher to notify the ship when the pumping should cease.

In each of the storage tanks are 1,900 feet of steam-pipe coils with which the oil is heated to a fluid consistency, preparatory to pumping it into tank cars for transcontinental shipment. The warmest oil is pumped into a 4-inch main, from which it flows by gravity into the cars, as many as fifteen being filled at one time. These cars resemble those used to carry petroleum.

WIRELESS UNDER GROUND AND WATER.

It is conceded that the greatest invention the war has brought forth is the wonderful new system for telegraphing under water and under ground. It will be known as the Rogers system, discovered by James H. Rogers, of the state of Maryland, and kept secret by the United States Navy department while the war lasted.

The new system so far is employed only for receiving. Radio messages sent out from powerful stations in Europe are now being read at underground receiving stations in the United States, and, in some cases, better than when caught by the elaborate and expensive air stations.

In addition, submarines under water are intercepting radio signals sent from shore, and, with crude apparatus, the scientist has succeeded in transmitting signals two miles from a submerged wire.

The theory most generally held, until Rogers demonstrated the correctness of his views, was that impulses hurled into the air from a radio transmitting station and deflected earthward became dissipated, as does lightning, when they struck the ground or water. The Maryland scientist, however, believed that the impulses flowed through the earth as through the air, and that it was only necessary to trap and measure them in the ground.

He had been at work on this theory for a long time before the United States entered the war, and interested naval experts. He offered the results of his work to the navy without price or restriction, and when they were accepted, after conclusive demonstrations, he was with much difficulty persuaded to accept even remuneration for the actual time given to co-operation with the government. One of the first steps taken was the request of the Navy Department, under war legislation, that the applications for patents be expedited. This, of course, was done.

Some of the main advantages of the Rogers system, so far as it has been developed, according to the experts, are almost negligible cost of construction, the intensifying of signals by pointing the sending apparatus towards the receiving station, and reduction of static interference. Because of the latter advantage the navy's receiving station at New Orleans, where communication with ships in southern waters swept by frequent electrical storms is maintained, uses the underground apparatus with very remarkable success.

In war, a great advantage is that submarines receive messages while submerged. Heretofore this has been done by wires trailing in the water.

The Rogers developments aroused electrical experts of the Government to new efforts to expand and improve the radio transmission facilities. Out of the experimental work done with this and other ideas steady advance has been made under war pressure, and Rogers's theories are interwoven with those of other men in the results that are being obtained.

ALFRED T. MARKS.

NOTES.

The death of Sir Roper Lethbridge removes from our list of contributors a prominent name. From the time this *Journal* was started, he was one of its literary supporters. He was, besides, a warm well-wisher of the *Journal*. He was the author of *India and the Imperial Preference* and the *Indian Offer of Imperial Preference*.

Mr. Findlay Shirras' report reviewing India's trade in 1917-18 (of which we publish a summary elsewhere in this issue) roughly points out the future development and the lines on which progress in trade is likely to take. The report says:—Three years ago few of us dreamt that India being far distant from the titanic struggle in Europe would have experienced the great changes that have taken place in the commerce and industry in Europe. In commerce continuous demands on the part of the Allies stimulated the export of commodities of vital or national importance and at the same time altered the direction of trade in industry. Necessity was the mother of invention and the war has been a great impetus to industrial development. War time prosperity has so far as our industrial activities are concerned, continued to bring grit to the mill trade. The returns of the year are surprisingly good considering the restrictions prevailing upon exports and the difficulties of freight and finance. Further on Mr. Shirras says:—In the direction of India's trade the effect of the war has been to increase the trade of India with the other parts of the British Empire. The most interesting feature in regard to the direction of trade is a large increase in the trade with Japan and the United States. When the long list of imports at the present time is examined the progress in our trade with Japan cannot be termed other than phenomenal. In 1917-18, the total trade with Japan exceeded that with

other countries except the United Kingdom and was valued at Rs. 52 crores. That was an increase of 400 per cent in imports and 103 per cent in exports over the pre-war average. The value of trade with the United States had grown to twice what it was in the pre-war period, being second only to that with Japan. Half of the import trade with the United States was made up of iron, steel and mineral oil, while the trade with Japan was chiefly in the import of cotton manufactures, matches, metals, silk manufactures and glass-ware and in the export of raw cotton.

Speaking at the inaugural meeting of the Chamber of Horticulture at the Caxton Hall, Westminster, on 2nd December, the Right Hon'ble R. E. Prothero, President of the Board of Agriculture, said it was not the big man, but the small men who could not help themselves who were going to benefit by such a chamber. There were three special points to which he thought they might give their attention. (1) The first was the question of Horticultural Research. The History of the World and of the War had shown that, though we were bad starters, we were good finishers. We had undoubtedly lagged behind other nations in scientific research in fruit growing, but the Board of Agriculture hoped that the endowment for research would be increased and developed. If this were so, he did not doubt that research work would be carried to such a pitch as would be a pattern to the whole world. (2) one of the objects of their Chamber would be the eradication and control of pests which had hitherto done enormous damage. (3) Then there was the question of *Railway Transport*. They must unitedly put forth effort and show a good cause for the increase of transport facilities and alteration of rates.

The Government of Mysore in passing orders on Mr. A. Chatterton's note on

Cultivation of Sisal Hemp in the State are pleased to direct that the following concessions be granted for encouraging the cultivation of Sisal Hemp in the State:— Free grant of land (unassessed kharab land by preference) to be made available either to individuals or village communities applying for the same up to an extent of 200 acres in each case under the following conditions:— (a) The land to be free of assessment for five years and then assessed at progressive rates leading to full assessment from the eleventh year. (b) The land to be planted up in full in five years. (c) The land to be liable to be resumed if it is used for any other purpose within twenty years of the grant. (d) Wherever there are not less than 1,000 acres under Sisal Hemp, Government will be prepared to help the cultivators to purchase the necessary machinery for extracting the fiber by advancing half the cost as a loan at a low rate of interest or arrange for the extraction of the fibre purchasing the leaves produced at a rate fixed so as to allow a fair margin of profit to the cultivators. These concessions will be in force for the present until about 5,000 acres are brought under cultivation, preference being given to subjects of the State in the grant of the land. A sum of Rs. 5,000 may be spent on nurseries to be started by the Forest Department as proposed by Mr. A. Chatterton as soon as the concessions are notified and a sufficient number of applications for land is received; the cost being met by reappropriation in the current year's budget of the Forest Department. 3. The Revenue Commissioner and the Conservator of Forests have been requested to take all further action in the matter in consultation with Mr. A. Chatterton and submit reports of progress made from time to time.

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Government in their review of the Report on the working of Agricultural Banks in Mysore state that the two working banks at Palahalli and Hongenahalli paid up in full

their dues to Government during the year and carried on transactions on a small scale with their accumulated surplus. The two banks at Churchugundi and Mallapura were wound up and their surpluses were utilised for objects of local public utility with the approval of Government. The work of collection of the arrears due to Government by the defunct banks still continues to be unsatisfactory. The arrears are heavy in the Bangalore and Mysore districts. The Registrar of Co-operative Societies is requested to arrange through the Revenue Commissioner for the issue of instructions to the local Revenue Officers to take more prompt and effective steps to ensure that the arrears are finally adjusted during the course of the current year. A scheme for establishing a land bank in the State has, it would appear, been received from the Agricultural Committee and details are being examined. The Registrar's proposals on the subject of the revival of Agricultural Banks, which he thinks may serve as a useful means of organizing agricultural finance under certain conditions, are awaited by Government.

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It is notified for general information that the British Board of Trade are now prepared to license the import of limited number of carpets into the United Kingdom. Before effecting shipment exporters would be well advised to make certain that the requisite import license has been obtained.

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In view of certain misapprehensions which appear to be entertained as to the exact effect of the recent action taken in regard to the manufacture of standard cloth, the Government of India consider it desirable again to draw attention to the fact that standard cloth is only meant for sale to the poorest classes for the relief of distress and that they have no intention of interfering with legitimate trade or of attempting to supply cloth for general consumption.

In view of the changed position in the region hitherto known as German East Africa, special attention is being given by British manufacturers and merchants to the industrial possibilities of that colony. In particular, the president of the Silk Association has directed attention to the wild silk of the anaphe silkworm, and has suggested that when German East Africa changes hands this raw silk will afford a good opportunity for British silk manufacturers. The anaphe silkworm occurs, as a matter of fact, in many parts of East, West, and South Africa, also in some parts of lower Syria and Southern Persia, where, in the latter regions, the natives, by a simple process in which a home-made mechanical device is employed, produce silk which compares favourably with the ordinary silk. Samples of the silk from Uganda were examined some years ago at the Imperial Institute, which introduced the product to the notice of leading silk manufacturers in this country. It is generally admitted that a new and cheap raw material for the spun silk industry would be of great importance, and it is to be hoped that energy and capital will be forthcoming for the development of this industry in Uganda, whence a certain amount of the silk is already being exported, and also in other British African colonies and certain regions in the Middle East. We believe that specimens of Uganda raw silk and of yarns and fabrics manufactured from it can be seen in the public exhibition galleries of the Imperial Institute.

In a recent number of the *Bulletin of the Imperial Institute* a former Governor of Burma—Sir Harvey Adamson, K.C.S.I., gave an account of this interesting but somewhat neglected dependency of the Empire. In the current number of the *Bulletin* (London: John Murray, 2s. 6d.) Mr. A. S. Judge, lately Chief Collector of Customs, Burma, completes the story of the great and still largely undeveloped resources of this territory, in an article entitled "The

Development of the Trade of Burma." Burma is of importance not only as an actual and potential source of supply of many industrial raw materials, but also as a market for British-made goods and Mr. Judge points out that the total trade of the country already amounts to about £3 13s 4d per head of the population, which puts it almost on a level with Spain and Portugal, countries with a trade of £4 0s. 0d and £4 3s 0d per head of the population respectively. Burma is the world's largest producer of rice and occupies an important position as an exporter of timber, especially teak, oil-seeds, grain and pulse, cotton, tobacco, rubber, hides and skins. With regard to minerals the most important product of Burma is petroleum, the exports of which have risen in value from £1,500,000 in 1903-04 to nearly £4,500,000 in 1916-17. On all these and other subjects much information is given in this article and attention is also directed to the nature of the chief imports into Burma and there are many useful hints to the British manufacturer, which are the outcome of Mr. Judge's long residence in the country and the special facilities he enjoyed for acquiring a knowledge of its trade. The same number of the *Bulletin* contains an important article on "The Future of the Trade in Cinchona Bark." Everyone is familiar with the story of the introduction of cinchona trees from South America into India and Ceylon and the development of a large export trade in cinchona bark from these British territories to Europe, a trade that also benefited London, which in those days was the world's cinchona market. Only those in the trade know however that India and Ceylon have long ceased to take anything but a very minor part in the production of cinchona bark, of which Java and therefore Holland has now a virtual monopoly, whilst Amsterdam has supplanted London as a market. The matter is of importance because quinine, which can only be got from cinchona bark,

is the recognised remedy for malaria, and with its vast expanses of tropical territory the British Empire is probably the largest consumer of quinine in the world. The *Bulletin* article supplies a full statement of the position of the trade in cinchona bark and quinine and clearly demonstrates the predominant position occupied by Holland and Java. The Germans were apparently making efforts to grow their own cinchona bark before the war, and there is appended to this article a report by the Institute on bark grown in the conquered German territory in East Africa, as well as a report on bark from St. Helena, which proved to be of good quality but of course is not available in large quantity. The *Bulletin* also contains Sir Walter Egerton's paper on "British Guiana and the Problem of its Development" and a note by Mr. G. C. Dudgeon dealing with the results of recent Egyptian researches on the Pink Boll Worm Pest of Cotton. Accounts are also given of some of the investigations recently carried out in the Institute laboratories on new paper-making materials, chiefly from the tropical colonies, on the improvement of certain types of edible beans, and on myrtle wax from South America.

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In order to maintain adequate supplies of foodstuffs in India during the coming months, the Government of India find it necessary to continue to exercise a certain degree of control over shipping in Indian waters. Hitherto this control has been exercised in respect of British vessels by arrangement with the Ministry of Shipping and in respect of foreign vessels by virtue of powers conferred on the Government of India by Rule 14-A of the Defence of India Rules. On the termination of the Liner Requisition scheme, the Ministry of Shipping are retaining power of licensing and direction of vessels registered at ports in the United Kingdom, and it is necessary that similar powers should be exercised in res-

pect of vessels registered in Indian ports. The powers conferred by Rule 14-A of the Defence of India Rules have, therefore, by notification in the Gazette of India, been extended to include the licensing and direction of all vessels not registered at ports in the United Kingdom and owners of such vessels are required to obtain licenses from the Agent to the Shipping Controller in Bombay before proceeding to sea, and to submit such licenses to the Collectors of Customs at the various ports at the time of applying for port clearance.

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From the *Zeitschrift fur Untersuchung der Nahrungs-und Genussmittel* of Munster we learn that the present day coffee substitutes containing as much as 50 per cent of lupins are being used in Germany. The infusion made from those substitutes has an exceedingly bitter flavour, difficult to improve by the addition of sugar or milk. This proves that the toxic substance contained in the lupins has not been removed. Roasting is not sufficient to eliminate this substance, although some workers maintain it is, and recent investigations show that lupins, if inefficiently treated and consumed, as in these substitutes, can cause illness, and must be considered as unfit for human consumption. For this reason the measures already taken in Austria to prohibit the use of lupins as a food should be adopted everywhere unless there is sufficient guarantee that the requisite preliminary treatment has been carried out. From experiments made in Holland, this is a somewhat lengthy operation. The lupins require to be soaked for 24 hours, then in fresh water boiled for 3 hours and left to cool for a further 12, then again soaked in fresh water for 12 hours, and crushed up by means of a wooden mallet, when they should be safe to be given to cattle, but are not of very great food value and should be mixed with oat straw. Of such a mixture, about three pounds per day should suffice for working oxen.

A Tractor, capable of drawing a plough through Coffee or Tea fields, may, owing to the closeness of the rows, seem a difficult thing to design, but a Frenchman has invented a machine, called the Jean Bache Vineyard Tractor, for use in the vineyards of France, which might be adopted for use on estates, in young clearings where the lie of the land permitted. In the vineyards of France the lines of vines are planted 59 to 79 inches apart, say 5 feet to $6\frac{1}{2}$ feet. The Tractor Machine is mounted on three wheels, of which two, the front wheel and the driving wheel, pass down the centre of the line which is to be turned over by the plough, a triangular arrangement carrying five Shares. The third wheel, which is chiefly for purpose of balance, runs in the adjacent line, the axle joining this "outrider" wheel to the main machine being elbowed, so as to form a sort of bridge over the vines, and is at least 59 inches high, so as to pass without harming them. In one design there are two of these balance wheels, one on each side of the machine, so as to provide further transverse stability to the tractor.

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GLEANINGS.

The search made necessary in Germany by the war for a substitute for cotton has revealed possibilities which may be made actual in the near future. The common stinging-nettle is likely to become an important factor in agriculture and in the development of the textile industry. Among the many fibrous plants experimented with, the nettle alone has fulfilled all the conditions of a satisfactory source of textile fibre. Investigations and practical tests, made in 1916 at Brunn and Reichenberg, confirm the hopes raised concerning the possibilities to be realised in nettle fibre. There exists now in Germany, according to the *Technische Blatter*, a "Nettle Cultivation Company." The price of 10 Marks per 100 kilograms of air-dried nettle stalks, which can, it is said, be paid, ensures sufficient gain to the growers, while the cost of preparation is not high. In 1915, 1.3 million kilograms of this material were collected in Germany, a quantity which increased to 2.7 million kilograms in 1916; and this without any attempt at systematic cultivation. Thus the capabilities of the plant have been thoroughly tested. From the standpoint of the factory it is affirmed that goods woven from this fibre are, for most uses, equal to cotton goods. Hence for middle Europe at least a large and increasing use of nettle fibre seems assured

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Some months ago it was officially stated in the House of Commons that subsidies are granted to manufacturers of iron and steel to compensate for the increased cost of production. Replying to a question on the subject on November 7th. Mr. Kellaway (Minister of Munitions) said that it would be impossible, within the limits of parliamentary answer, to give the scales of the subsidies, but it was estimated in July last that grants amounting to £ 47,000,000 had been

approved. Recently increase had had to be given, owing to further rise in the cost of coal and rates of wages. The Government is practically the only buyer, being the purchaser of 98 per cent of the output. He added: "A Committee is now sitting with a view to seeing how the arrangement can come to an end in the event of the cessation of the hostilities."

The establishment of a paper industry in the Transvaal, says *United Empire*, is now an accomplished fact. It has been decided to start with the production of cardboard only, for which there is a big demand in the Union; but, as the industry progresses, the manufacture of brown paper, brown boards, and many other cognate commodities will be undertaken. The plant, which is of an extensive character, is being manufactured locally. Waste paper, rags, sacking, and twine will be used as raw material at first, but as time goes on it is intended to include a greater proportion of natural products—such as fibre, spent wattle-bark, etc. The enterprise is all the more interesting in view of the fact that it is probably the first real attempt in the Union to produce this article on a commercial scale.

Professor Raitt, consulting cellulose expert to the Government of India, takes a very optimistic view as to the development of paper pulp manufacture in India. In a recent lecture, after pointing out that the world's annual consumption of paper was ten million tons and that the demand was growing at the rate of 25 per cent every ten years, he expressed the opinion that India could do a very great deal to fill the gap. Bamboo and some Savannah grasses, he said, could be used to produce twenty million tons annually for India, Burma, and Ceylon, so that the country could produce pulp for the whole world.

It is reported that the Government of Ceylon intends to take steps to promote the

manufacture of salt in the Island on a much larger scale in the future. This news is very welcome, because the salt industry there is generally recognised as affording scope for considerable expansion, and its development would not only add to the Island's wealth but would also enlarge the sources of revenue, a factor which is of special importance at the present time.

The Capital of North Ireland Paper Mill Co., Ltd., has now been increased from £100,000 to £200,000. It is intended that the £5 shares be divided into £1 shares and for every such five shares three £1 bonus shares be issued. To meet the additional £60,000 necessary it is proposed to appropriate £60,000 of the credit balance on the P and L Account.

Mr. G. B. Barham, in the *Liverpool Daily Post* says that the oilskins used in German Navy are of paper chemically treated and impregnated with oil and pitch, and the paper-lines clothing has been served out to men in the German Air Service. He says that these garments stand fairly hard usage.

It is not at all unlikely that the Australian Government will devote some capital, probably a quarter of a million sterling, to furthering the interests of paper making industry in that country.

Messrs. Marshall, Sons and Co. is under conversion into a limited company with a factory near Calcutta for manufacturing tea machinery. Capital, 40 lakhs; 2½ lakhs over subscribed.

The Gazette of India for the 22nd February 1919, contains detailed information regarding further relaxations of the export restrictions in the United Kingdom.

The import of old newspapers in bulk except from certain European destinations is now permitted. Full particulars can be obtained from the various Custom Houses.

A new saw-mills company has been floated in Calcutta (capital 250,000 rupees). Managing agents, Messrs. Linton, Molesworth and Co.

SPEECHES AND PRONOUNCEMENTS.

INDIAN AGRICULTURAL SITUATION.

Speech by Sir Claude Hill.

At the meeting of the Imperial Legislative Council held on Feb. 19, Sir Claude Hill laid the following statement on the table :—

'As desired by His Excellency the Viceroy I take this opportunity to make a comprehensive statement regarding the agricultural position resulting from the wide-spread failure of the last monsoon and the economic situation in regard to food-stuffs ensuing from it. I will also explain the action we have taken in respect of our food-stuffs, but in order that the Council may be able fully to appreciate the reasons for that action and its variations I shall have to go back to a period anterior to the last monsoon.

'It will be within the recollection of this Council that, as explained in 1916 and 1917, the Government of India undertook to co-operate in a scheme for the export to Great Britain and her Allies of the wheat required by them and that export of wheat for other purposes and destinations was brought under strict control. Later, in connection with the great pressure upon rolling stock on Indian railways resulting from the shortage of sea freight, it became necessary in April of last year to appoint directors of civil supplies who were empowered to grant certificates in respect of articles required on civil account which gave priority for those articles over ordinary uncertificated traffic. Food-stuffs were, during last summer, dealt with by the directors of civil supplies under this system. When it became apparent during July last that there was reason to apprehend an unfavourable agricultural season the food-stuff board, which had come into being as a result of the Delhi Conference, advised and the Government approved the advice, that a meeting should be convened at Nagpur of all directors of civil supplies and of the railway authorities chiefly concerned

TO CONSIDER THE SITUATION

and to concert measures of a precautionary character. As a result of that conference, improvements were effected in the system of priority certificates and a better understanding was reached between different provinces and the railway authorities as to the methods by which railway traffic in food-stuffs

should be regulated. Though the latter end of August saw a partial improvement in the *kharif* situation in parts of India the hopes then engendered were disappointed. September and October were unusually rainless and it became obvious that we must prepare for a severe restriction in the output of *kharif* crops over a very wide area. Accordingly we telegraphed on October 2 to the Secretary of State describing the situation and intimating the inability of India to continue the purchase and export of wheat and other food-stuffs other than those required for Mesopotamia. We further decided that the situation was so serious that it required to meet it, a revision of

OUR ORGANIZATION.

We substituted an executive officer, the food-stuffs commissioner, for the advisory board which had till then helped us. Prompt action, capacity to confer direct with provincial authorities on the spot and defined authority were considered essential in substitution for consultation and advisory powers. The central transport and food-stuffs board had helped the Government admirably during the period when events were maturing, and I take this opportunity to express on behalf of the Government of India our acknowledgment of the services so spontaneously given by the official members of that board.

At the conference convened on October 15 in Delhi, at which the newly appointed food-stuffs commissioner was present, the whole situation was revisited and discussed in the light of the agricultural situation as it had developed, and, having regard to the measures already taken in co-operation with His Majesty's Government for the restriction of exports. It will be remembered that on October 15 the war was still in progress and the action then determined on had to be limited with due regard to that dominant factor but the dramatic collapse of Germany resulting in the Armistice still further

FREED THE HANDS

of the Government of India in respect of external obligations and I will now describe the steps taken in November and December to

CONSERVE THE FOOD RESERVE

of India. On our representation to the Secretary of State, His Majesty's Government not only agreed to

our maintaining our prohibition against exports of wheat to all destinations, but, as regards rice, they also acceded to a scheme which we proposed to them, under which the exportable surplus of the Burma crops of 1919 should be utilized primarily for the needs of India and of certain countries which contain Indian population and are dependent on this country for their supplies of rice. Practically, then, it may be said that those western and many eastern markets which have, in the past, been regularly drawing on India, have now turned elsewhere for their supplies of rice and wheat. Again, early in December, when the brief review of the position indicated the necessity of assuring an additional supply of wheat, we proposed through the Secretary of State to the Home Government programme of

PURCHASES FROM AUSTRALIA

to tide over the period until the *rabi* was harvested. I am glad to say that through the good offices of His Majesty's Government, we have secured this wheat and freight for us at cost price. We have been able to make some progress with this programme, and actually we have purchased, and there are or will shortly be on their way to us 125,000 tons of Australian wheat. The original programme, which contemplated an import of 200,000 tons we have now still further extended, and provided that shipping can be made available, we trust that it may be possible for His Majesty's Government to obtain for us in Australia 500,000 tons to reach India before the end of July. In regard to the Burma rice crop we have taken still further steps. Not only have the exports from Burma been restricted to certain destinations, as I have explained, but even these limited exports are to be subject to a price control, for no export license is being granted except on satisfactory evidence being produced, to the effect that the price paid does not exceed the maximum controlled price. Finally, we have secured two substantial reductions in the freight on rice from Rangoon. The first resulted in a cheapening of the price of this commodity in Bombay by a rupee a bag and in Madras by 12 annas, while the second, which has brought down the freight rate to Bombay to Rs. 30, will ensure a further reduction of a rupee per bag in the place of this necessary article. These measures have been supplemented by prohibitory orders against the exportation of other food grains. A position has thus been reached at which

NO FOOD GRAINS WILL LEAVE INDIA

except in very limited quantities and for exceptionally strong reasons. In such circumstances, we felt we were able to contemplate a relaxation of the restrictions which had been placed on the movement of food-stuffs within India. The imposition of these restrictions on the movement of food-stuffs dates back

to the time when as will have been understood from my earlier remarks in order to facilitate the purchases for the Royal Commission and, at the same time, to protect the Indian consumer against an undue inflation of prices, it was found necessary to prohibit the movements of wheat from the Punjab, but the main cause which led to the regulation of the traffic in food-stuffs was, as His Excellency the Viceroy explained in this Council last September the congestion on the railways which, owing to the enormous quantity of military material and the large number of troops which had to be transferred, formed a very serious difficulty in providing facilities for the movement of the commodities essentially required by the civil population. Directors of civil supplies were then created, whose certification of any particular traffic to was, as I have explained, to be accepted by the railway authorities as entitling such traffic to priority. Subsequently, it was found that the holders of these priority certificates were, in certain parts of India, thereby placed in a favourable position and were taking advantage of this to raise prices against the consumer, and we were approached by almost all the local Governments who asked that they should be empowered to

REGULATE THE MOVEMENT

into from and within their provinces. At the time this demand manifested itself we felt very grave doubts as to the desirability of acceding to it, for we anticipated as has indeed come about that the discretionary power so granted to local authorities would result in certain areas finding themselves cut off from purchasing their essential requirement, those parts of the country to which they had ordinarily in the past looked for their supplies. The opinion of the local Government, was however, so strong and insistent that we decided to defer to it, at any rate until some experience had been gained of the way in which these powers would be used. At the same time, we withdraw from the scope of the local Government's control two essential commodities, rice and wheat which, we decided must be kept in our own hands, and in regard to which, while we hear the news of the local government as to the capacity of their provinces to supply, we recognised that it must be left to us definitely to decide to what extent each supplying province should contribute its quota. More recently, we have added gram to the list of commodities the movement of which we ourselves regulate. Towards the end of the last month, as a result of the protests which we received from the Government of Bombay against the results of the policy of entrusting to local authorities.

THE RIGHT OF DIRECTING MOVEMENTS.

From their provinces, we have withdrawn this power from all local governments. The protest from the Bombay Government, to which I have referred, laid stress on the very great difference between the prices in Bombay and those prevailing in upcountry centres. It is indeed only a natural result of the obstacles which have been placed by the system of regulation in the way of free movement of food-stuffs. That there should be, in different parts of the country, abnormal variations in the price of food-stuffs in itself was a grave wrong but other disadvantages followed from this attempt to run counter to economic laws. Trade was hampered, the fullest use was not made of long established trade connections, and it was inevitable that

the setting up of new trade connections should be attended with difficulty and delay. I can only make a brief allusion to

THE SUBJECT OF PRICES.

These have reached an abnormally high level, and we fully realise the hardships that they entail on the great mass of the population but during the period following such a world-wide cataclysm as we have been through during the last four years it is idle to expect that conditions should return at once to the normal. The effect of the diversion of human effort from the labours of peace to the work of war is bound to continue to make itself felt for some time to come. To a large extent India has been saved from many of the consequences which other belligerent countries have had to undergo, and it is only, in the last few months, that we have seen prices here begin to move towards the level which obtains in the outside world. And even now, in many cases, Indian prices are still much below the world prices. It has been argued, in some quarters, that the present level of Indian prices indicated a shortage of supplies. This is not necessarily the case, for we have seen that the rise in prices is not limited to any specific commodity or group of commodities but is practically universal and for the universality of a raise in prices we must probably look to some cause of general application. The whole subject is an intricate one and would need more elaborate discussion than I can give to it here. As regards

THE PALLIATIVE AND RELIEF MEASURES

Regarding which questions have been asked in the Council, large allotments have been made for taccavi loans, a measure of relief which proved to be of the greatest benefit in the famine in the United Provinces in 1913-14. The programmes of public works are being expended, where necessary, to provide labour and earthwork is being started on some projected railway. Direct measures of relief are only in the initial stages, such as the opening of poor houses, on a small scale, for the distribution of gratuitous relief. It has hitherto been an accepted principle, embodied in the famine codes that gratuitous relief should not be given before scarcity has been declared but we have found it necessary to relax the principle in some cases where the economic distress has been aggravated by the epidemic of influenza. One bright feature illumines the otherwise sombre retrospect of the past season. The monsoon was slightly more active in November and December in Madras and the Central Provinces especially, while the rain of three weeks ago all over the country except Bombay had been of incalculable benefit to the standing *rabi* of Upper and Central India. We can now hope to reap a *rabi* crop sufficient, and the imports of Burma rice with Australian wheat to carry us through the ensuing months, and though the position is not free from anxiety, an anxiety largely occasioned by the degree to which the world at large is hampered by shortage of shipping freight. I think we may hope successfully to tide over the period intervening between now and the next monsoon harvest. I should like to pay my tribute to what His Excellency said in regard to Mr. Gubbay's work. Without his resourcefulness and devoted industry, we should have found it hard at times to carry on and the general public as well as the Government owe him a warm debt of gratitude.

TOPICS FROM ECONOMIC PERIODICALS.

INDUSTRIES AND COMMERCE.

Possibilities of Glass Manufacture in Burma.

Mr. A. P. Morris, Principal, Government Engineering School, Indian and Provincial Art Officer, Burma, has written a useful Note on the possibilities of glass manufacture in Burma. We publish the text of the note. In forwarding the note to the local government, Mr. Morris remarks:—

"I do not think my experiments can be carried much beyond this point without further expenditure. The next step would be to design a glass furnace fired by paddy husk and to engage an expert to deal with the manufacture of glass articles. Naturally I should like to do this, but I hardly think it is necessary. The industry is not a village industry but one which will require capital and I think the best thing would be to make this information public and see if any of the larger firms in Rangoon can be induced to take the matter up. I think a comparatively small expenditure would satisfy any firm of the feasibility of manufacturing glass at very small cost, particularly if the firm owned a paddy mill and put up its glass factory next door. The conversion of the glass into useful articles would need expert supervision but there is plenty of reason to think that local labour could be trained to glass blowing and other processes.

The production of glass has so far not been attempted in Burma. One reason has been the lack of a supply of sufficiently pure silica. This indeed has been a factor in the failure, until very lately, of any attempts to produce good glass on a commercial scale all over India, though recently suitable supplies have apparently been found in Madras. Quartz sand there is in quantity, but always with such an amount of iron in it as has rendered the production of anything but dark green bottle glass impossible. A very small quantity of iron colouration can be corrected with Manganese? but this is only possible if the percentage of iron is very low.

As a source of a particularly pure form of silica it seemed to me that paddy husk might be useful. Experiments show that the ash is mostly silica and that the husk gives about 18 per cent of white ash. Using this as the source for my supplies of silica I have, with the help of Mr. Nicholas, Science Lecturer at the Engineering School, conducted a few experiments. The husk used was not cleaned and the small amount of iron indicated by the tests was probably most of it due to the clay present in the dirty

husk, even so the silica yielded a glass of a light green or yellow colour, the deepest shade not being deeper than the colour of a good peridot. By the use of manganese dioxide a colourless glass can be prepared, and I have managed to produce in the laboratory a colourless lime-soda glass of fairly high fusibility.

Further, using the paddy husk-fired pottery kiln I have found that the temperature obtainable by the firing of paddy husk is sufficient for the manufacture of glass. The kiln was not designed for glass manufacture and the amount of husk required to obtain a given quantity of glass was therefore not calculable. With a furnace designed for the purpose paddy husk firing would be very suitable.

In my early experiments I carried out the glass production in two stages, first producing soda glass and then converting the soda glass into a non-soluble glass. It was also under the impression that we should have to design special apparatus for reducing the husk to white ash as the ash of a paddy furnace is not fully reduced and contains a large amount of unburned carbon.

Subsequent experience with the pottery kiln shows that a large part of the ash can be obtained with only a small percentage of carbon and that this percentage of carbon does not matter. It is possible to take the ash with its carbon and convert it into marketable glass at one firing.

If the husk is washed before reduction the percentage of iron is greatly reduced, but I am not sure that it would not be more economical to use it as it is and add manganese. One would have to experiment on a fairly big scale to determine this point.

According to Mr. Raikes, Deputy Controller of Munitions, there are 250,000 tons of unused paddy husk available yearly in the Rangoon area alone. This quantity was calculated before the rather widespread use of paddy husk as a fuel outside the paddy mills which has developed during the last few months; but the quantity available is still very great. More husk would have to be burned than would be necessary for the production of a given quantity of glass as regards the amount of silica required. The effective calorific value of the husk is about 5,000 calories per pound.

The second ingredient in glass manufacture is sodium carbonate or better still sodium sulphate and this is also available locally. In fact if the production can be stimulated on the lines indicated in my note on soap sand there should be no lack of supplies.

Lime of pure quality can also be obtained and manganese is available in Burma or could be imported from India.

The experiments conducted indicate that—

- (i) Paddy husk can be used to develop sufficient heat for glass manufacture. Measurements in my kiln gave between 1,100° and 1,200° C.
- (ii) Paddy husk yields as a bye-product silica sufficiently pure to be suitable for the manufacture of colourless glass. Further the silica is in a finely divided state which makes its conversion into glass particularly easy.
- (iii) The other ingredients for a lime-soda glass are available locally and the glass obtained is of high fusibility and good quality.
- (iv) With the husk fuel at such a low price and the silica in a finely divided form as a bye-product the manufacture of glass would be particularly cheap.

THE MADRAS RICE MILL INDUSTRY.

The Department of Industries, Madras, has just issued a Bulletin (No. I—New Series) entitled "The Milling of Rice in the Madras Presidency" by Mr. L. B. Green, Assistant Director of Industries, Madras. The following extract is taken from it:—

In concluding this brief survey of the rice milling industry, it seems desirable to attempt briefly to summarize the position and possibilities of the industry in Madras. The industry which is centred chiefly in the delta districts, Godavari, Kistna, and Tanjore, has made great strides in recent years and is now one of the most important industries in the Presidency. Moreover, unlike the Burmese mills, which are chiefly controlled by the large European export firms, it is the product of Indian enterprise, and is entirely in Indian hands. The lack of interest shown by the European firms in Madras in the development of the industry is probably due to the fact that the rice produced is required mainly for local consumption and that no appreciable surplus appears to be available for export. But from whatever cause the non-participation may be attributed to the industry in Madras has unquestionably suffered from the lack of attention given to it by European rice milling experts. Reference has already been made to the unsatisfactory features of the rice mills in the districts of Godavari and Kistna where the mills are not erected in accordance with any standard plan, and are generally operated under the most inefficient and uneconomical conditions. In Tanjore it has

hardly passed the stage of a rural industry, and in other districts the indigenous system of husking remains in force. In contrast to this state of affairs it may be pointed out that most of the large Burmese mills are controlled by European firms, and have had the assistance of European Engineers in the supply of plans and the provision of plant and machinery adapted to local requirements. The existence of an export trade in Burma has made it essential for efficient mills to be constructed in order to reduce their cost of cleaned rice to a figure that would permit of competition with foreign mills, and in Madras this stimulant is lacking. It is unlikely that Madras will ever rank as a large rice-exporting province unless agricultural improvements result in a considerably increased yield per acre, and speaking generally it is not, therefore, necessary to produce such highly finished rice as that produced by some of the Burmese mills for export. But the fact of the export trade being of relatively small proportion in Madras, is an insufficient reason for the construction of inefficient and inadequately organized mills, as in these mills the cost of production of finished rice must necessarily be high. If well-designed mills were constructed in the various rice growing districts under skilled supervision the result of adopting improved methods of milling would be production of superior finished products at a lower cost. It is greatly to be hoped, therefore, that after the war the crude mills of the Kistna and Godavari districts will gradually give place to modern milling plants installed under skilled supervision, and that in the Tanjore district, the small single huller oil engine driven plants will give way in some cases to modern large scale mills, and in other to the smaller self-contained plants on the Rangoon system which have been referred to elsewhere in this bulletin. The result of such a development would be that the chief products (rice and bran) would be considerably improved in quality and that the lower cost of production consequent on the introduction of the modern system of milling would enable the price of rice to the consumer to be lowered. Also if the numerous isolated small milling plants of the Tanjore District were combined into a number of properly organized commercial factories (which need not necessarily be large), there is no reason why a considerably larger share of the Ceylon rice trade should not fall to this District in seasons when a surplus is available for export. At present Tanjore is in a very strong position owing to the lack of steamers for the shipment to Colombo and the West Coast of Madras from Rangoon of the usual supplies of rice for the Ceylon and Malabar markets. But unless modern methods are introduced into Tanjore, and the cost of production reduced this trade will

eventually revert to Burma as soon as there is a resumption of normal conditions. As regards the districts in which the indigenous system of husking still flourishes, it is to be hoped that properly organized factories will evolve direct from the hand husking stage without the introduction of the small single huller mill as an intermediate stage of development. The installation of the latter type of mill should be confined to isolated towns or villages where the production is required for the needs of the local population, and where the demand is too small or the supply of raw material available is insufficient to keep a large mill on the Rangoon system working at full capacity, but in these cases shellers should invariably be installed. It is very desirable that husking and milling of rice by machinery should be introduced in the place of the primitive indigenous system of husking in districts where up to the present it has not taken root, for a large quantity of manual labour is being devoted unprofitably to the indigenous system, labour which as the home industries of Southern India are developed should be able to find more lucrative employment in other lines of manufacturing activity, for not only does it give a poor return to the producer, but has the effect of maintaining at a high level the price of rice for the consumer, which would be reduced in these backward districts by the introduction of the modern system of rice milling.

EXPANSION OF COTTON SPINNING IN JAPAN.

H. M. Commercial Counsellor at Yokohama
writes to the *Board of Trade Journal* :—

The Spinners' Union of Japan have given the number of spindles in course of installation in October last as 95,644 for coarse-sized yarn, 172,112 for medium-sized yarns, and as 133,098 for fine-sized yarns.

The comparatively large number of medium and fine-sized yarn spindles is due to the fact that it is far more lucrative to produce the medium and fine sized than the coarse sizes, and the spinning industry of Japan is tending to develop more in the manufacture of fine-sized yarns. In addition, the market has been cultivated greatly for Japanese cotton fabrics in China, India, and other Oriental countries in the place of the British products due to the war.

Classified according to their respective mills, the additional spindles are as under :—

SPINDLES TO BE ADDITIONALLY INSTALLED.

Name of Mill.	Coarse-sized. Yarns. No.	Medium-sized. Yarns. No.	Fine-sized. Yarns. No.
Fukushima	...	0	7,680
Osaka Hosiery	...	8,400	1,600
Matsuoka	...	0	2,895
Osaka Orimono	...	0	0
Idzumi	...	20,672	0
Kishiwada	...	4,628	0
Wakayama	...	23,800	0
Uchimi	...	5,832	0
Hinode	...	6,120	0
Kurashiki	...	8,128	24,480
Saga	...	1,026	0
Oita	...	0	21,788
Oriental	...	15,744	0
Sagami	...	0	20,400
Kanegafuchi	...	314	5,052
Fuji	...	0	59,840
Tokia Calico	...	800	15,200
Matsuta	...	5,576	0
Japanese-Ghinese	...	0	27,932
	95,644	172,112	133,098

REDUCED FREIGHT RATES TO JAVA.

A reduction was made in October in the rates of freight for cotton goods from Japan to Java owing to the large amount of tonnage now available for this service.

Dutch lines at that time continued to quote yen 26 per ton less 5 per cent, but the Osaka Shosen Kaisha reduced their rate, which used to be yen 32, to yen 28 per ton to Surabaya and Samarang, and yen 29 per ton to Batavia. The Nippon Yusen Kaisha, which was previously charging yen 33, reduced its rate to yen 27'50, less 5 per cent. The Nanyo and Taiyo lines do not appear to have reduced their rates, but it is understood that they are prepared to accept lower rates than those officially quoted.

CARRIAGE OF AMERICAN COTTON,

A contract has been entered into between the Japan Cotton Spinners' Association and three leading Japanese steamship companies for the carriage of American raw cotton to Japan during the period 15th October, 1918—30th April, 1919. The latter contract to carry 200,000 bales (the same quantity as in the previous season). Freight is fixed at yen 2-15 per 100 lb., as compared with yen 1'50 in the 1917-18 contract. Remaining features of the two contracts are practically identical.

DEVELOPMENTS IN SERICULTURE.

An important development in the United States silk industry, if climatic conditions are favourable, was recently announced in the press, says the *Board of Trade Journal* :—

So successful, it is stated, has the Austin Silk Plantation and Manufacturing Company been, that it has just increased its capital stock from 12,500 dols. to 500,000 dols., and changed its principal place of business from Austin to Houston. This company began the culture of silkworms and the production of silk near Austin about three years ago.

It is stated that the company has acquired a tract of more than 300 acres of land near Houston, which it will plant in mulberry trees for the propagation of silkworms. The production of silk and its manufacture on an extensive scale is to be developed as rapidly as possible, according to the promoters of the project. It is announced that the silk farm near Austin will continue to be operated.

It is not stated how much of this capital is devoted to sericulture.

AVAILABLE RESOURCES FOR CELLULOSE PRODUCTION.

British India consumes approximately 75,000 tons of paper and paper goods per annum, and of this, 30,000 tons are supplied from Indian mills. Local production has been stationary for several years, because, according to the Government's cellulose expert, the limit of its present resources of raw material has been reached—and even to maintain the present output 12,000 tons of wood-pulp have been imported from Europe annually, says the *Board of Trade Journal*.

In order to interest financiers in the further development of the industry, the cellulose expert recently addressed an audience at the Indian Museum, Calcutta, on the value of the bamboo and Savannah grasses as a source of cellulose supply. He stated that at a modest estimate there is available under sound manufacturing conditions in Burma, Bengal, and South and West India, enough bamboo to produce 15,000,000 tons of cellulose annually—the world's consumption of paper at present being 10,00,000 tons

per annum. From Assam, also, he stated Savannah grasses can produce a further 5,000,000 tons annually. India could, therefore, produce pulp for the whole world.

ADVANTAGES OVER SPRUCE OR FIR.

To grow a spruce or fir tree to pulp-wood size takes from 40 to 60 years, with the result that a factory which may at its start have its supplies at its back-door finds these year by year receding into the distance with constantly increasing transport costs. Bamboos and grasses come to their full maturity as yearly growths, although it is necessary not to reduce the reproductive vigour of the plant by too frequent cropping. With bamboo this may mean a three to five years' rotation, and with grasses two to three years, according to soil and climate.

THE MANUFACTURING SIDE.

On the manufacturing side the Forest Research Institute of the Indian Government has succeeded in solving the difficulties which faced it at the beginning of its efforts. The chief of these were two in number: (1) the nodes or knots and their obstinate resistance to penetration by the digestive liquors employed (this has been overcome by the simple operation of totally destroying and opening out their structure by crushing) and (2) the resistance to efficient and economical bleaching. The Institute has at last succeeded in evolving a system of digestion which entirely eliminates this trouble, and pulps can now be produced from the bamboo which are equal to the best wood-pulps in both quality and colour. The Institute is about to embark upon an extensive enlargement of its industrial exploration activities, and these will include a complete modern pulping plant which will enable its laboratory investigations and results to be repeated, expanded, checked, confirmed or corrected on a scale large enough to permit of factory methods being employed.

MANUFACTURING COSTS.

Chemically-produced wood-pulp costs, the cellulose expert stated, on the average pre-war for wood alone and ignoring for the moment all manufacturing costs, £4 10s.; i. e., about Rs. 65 to Rs. 70 per ton of pulp. Bamboo and Savannah grasses, owing to their abundance and the fact that they reproduce themselves annually and that there is no other serious demand for them will, assuming good manufacturing facilities, cost only Rs. 25 per ton of pulp. There is, therefore, at the outset some Rs. 40 in favour of India in this one item alone. In a plant producing 10,000 tons per annum this means an advantage of 4 lakhs over a European competition. Inclusive of water freight to paper mills it will, as far as can be estimated, cost round about Rs. 100 to Rs. 110 per

ton delivered to consumer. Its value, pre war, in comparison with imported wood-pulp, was about Rs. 150. After the war it is making large reservations for safety to call this Rs. 200 per ton, headed. The increased cost of freight alone from Europe will account for nearly the whole of this rise.

DEVELOPMENTS IN CHEMICAL INDUSTRIES.

The following notes on certain developments in the United States Chemical Industries are taken from official announcements and various articles in the American press:—

POTASH DEVELOPMENTS IN UTAH.

An account of the potash developments in Utah since 1914, given in the press, attributes the principal sources of potash to the alunite deposits, the waters of the Great Salt Lake, salt beds and marshes, and cement districts.

At the present time the following companies are actually producing:—

The Mineral Products Company, of Marysvale, which is the pioneer in the potash industry in Utah, having commenced operations in 1915. Its new large reduction plant has maintained a steady production since it was started in February, 1918. It uses the Chappel process in working the alunite deposits and is at present turning out about twenty-five tons of sulphate of potash, of 95 per cent purity, daily. Successful experiments have also been made in reducing the aluminium oxide accumulated on the large dump to the metallic state.

The Florence Company is also erecting a mill a mile south-west of Marysvale to treat alunite deposits. It expects to turn out ten tons of sulphate of potash a day, of 95 per cent purity.

The Salt Lake Chemical Company is making from three to four tons of potash daily at Burmester, at the end of the Great Salt Lake, utilising the waters of the lake. It is a subsidiary of the Diamond Match Company, and began producing in January, 1917.

The Utah Chemical Company, with an output of ten tons daily of a lower grade sulphate of potash, is situated three miles east of Saltair. It is a subsidiary of the Southern Cotton Oil Company, and is allied with the Virginia-Carolina Chemical Co., and the Inland Crystal Salt Co., utilising the by-product of the last company and producing a low-grade potash entirely used as a fertilizer.

The Portland Cement Company of Utah, and the Ogden Portland Cement Company, have quite recently erected potash recovery plants at the works of the Riverside Portland Cement Company, and are now turning out about a ton and a-half each daily of K_2O_3 , extracted from the cement by a process which has gradually been improved upon, until now a high-grade product is obtained.

Besides the operations above mentioned, there have been many announcements of discoveries of potash-bearing minerals and waters from various parts of Utah; for instance, the prospect in Little Lake, near Perowna, the deposits in rock form east of Perowna, Quitchipa Lake, west of Cedar City, and many others. In order, however, to enter the market in competition with foreign producers, soluble potash salts must be obtainable cheaply and in larger quantities.

It is expected that the potash production in Utah during 1919 will reach approximately 55,000 tons; in 1916 the total production in the United States was only 35,739 short tons.

PRODUCTION OF SULPHUR.

An amendment to the charter of the Texas Gulf Sulphur Company, increasing its capital stock from 750,000 dols. to 3,000,000 dols., has just been filed in the office of the Secretary of State in Austin, Texas.

The Texas Gulf Sulphur Company is preparing to develop a very large underground sulphur deposit near Matagorda, Texas, within a few miles of the Gulf of Mexico, and only a short distance from the big sulphur property of the Freeport Sulphur Company.

It has been reported from time to time that the initial plans of the company call for expenditure of approximately 4,000,000 dols. in the installation of batteries of giant boilers and other equipment preparatory to beginning actual mining operations. It has already finished the construction of a six-mile spur track, connecting it with rail-road outlet, and has made considerable progress with its other improvements. By means of test holes it has proved an enormous tonnage of sulphur, it is stated. The mineral product will be brought to the surface in dissolved form by powerful steam pressure.

The output of the Freeport Sulphur Company is the second largest in the United States, being exceeded only by the Union Sulphur Company, of Sulphur, La. It is stated that the Texas Gulf Sulphur Company plans to operate eventually on equally as large a scale as the Freeport Sulphur Company or even the Union Sulphur Company.

FUTURE OF THE DYE INDUSTRY.

Dye manufacturers held a conference with the War Industries Board in November to discuss

general conditions in the newly-developed industry, and to discuss plans which might aid in permanently establishing the dye industry in the United States on a more extensive scale than as yet attained.

Proposals were made at the conference that in order to retain the commercial advantages obtained because of the shutting of the flow of European dye-stuffs into American markets, all incoming dye shipments from abroad should be imported under a license system.

Further conferences are expected to be held by the Board with representatives of the industry for a more thorough discussion of the situation.

NEW CHEMICAL MANUFACTURING COMPANIES.

Fourteen companies for the manufacture and distribution of chemicals, drugs and dyes, were organized during November their aggregate authorised capitalisation being 3,170,000 dols. This figure represents an increase as compared with 2,760,000 dols. in October, and, in fact, is the largest total for any month since April of this year. The indicated investments for the first eleven months of 1918 is 66,988,000 dols., which is less than half of the total for the corresponding period of last year.

The aggregate authorised capital of new drug and chemical companies formed during the war period—August, 1914—30th November, 1918—is shown to be 394,795,000 dols.

SUBSTITUTE FOR PLATINUM.

The Chemicals Division of the United States War Industries Board have announced the discovery of a new substance to take the place of platinum in the manufacture of sulphuric acid.

The discovery was made during the latter days of the war. Sulphuric acid is required in the manufacture of high explosives, and a serious stringency was being faced due to the scarcity of platinum and the difficulty of obtaining it, even in small quantities from Russia.

In the manufacture of sulphuric acid, sulphur dioxide (SO_2) is first obtained by burning sulphur pyrites. This sulphur dioxide gas, after being dried, is passed over magnesia containing a small percentage of platinum. In this process the sulphur dioxide takes up an additional atom of oxygen (O) thus forming sulphur trioxide (SO_3). This sulphur trioxide, in turn, is passed through water (H_2O), forming sulphuric acid (H_2SO_4).

FUNCTION OF THE PLATINUM.

In the above operation the platinum performs the function of a catalyst, in that it quickens the process of converting the sulphur dioxide into sulphur trioxide.

The suggestion which resulted in the discovery of the substitute was made by the Director of the

Chemical Division of the War Industries Board, and President of the Armour Fertilizer Works. It was developed by a Fellow of the Mellon Institute of Industrial Research at Pittsburgh.

COMMERCIAL PLANT ESTABLISHED.

According to the United States "Official Bulletin," not only has the new catalyst been demonstrated as practical in laboratory tests, but a commercial plant has been established which is producing the substance in quantity. It is cheaper than platinum and has been found to be less sensitive to "poisoning." Altogether, the discovery is regarded as a distinct advantage in the art.

The same catalyst has been tried out successfully in a modified Deacon process for making chlorine gas in connection with the manufacture of "mustard gas." By its use it has been found possible to effect a considerable saving in the electrical horsepower required by the process. Ordinarily, for the manufacture of 100 tons of Chlorine, 20,000 horsepower would be required. With the use of the new catalyst the same quantity can be made from 2,000 horsepower.

SUBSTITUTE FOR GLYCERINE,

Another discovery made by the Mellon Institute, working in co-operation with the Chemical Division of the War Industries Board, is a substitute for glycerine for use in chewing tobacco. This was the result of efforts to aid the tobacco industry of the country when it had become necessary for the Government to take over all glycerine supplies for the manufacture of explosives.

Under similar circumstances the Mellon Institute was able to find and develop substitutes for acetic and acetones.

AFTER-WAR EXPORT OF CHEMICALS.

With regard to chemicals, which, due to war stimulation, the United States is now producing in surplus quantities, steps are now being taken by the industry to develop foreign markets, and consideration has been given in the industry to the establishment of co-operative selling agencies under the Webb Act. It is not unlikely that before long, the United States will be exporting in competition with other countries certain chemicals which she has hitherto been accustomed to import.

GASOLINE SUBSTITUTE.

The following advantages are claimed in the press for "Liberty Fuel"—a gasoline substitute which has been perfected under the direction of the War Department Research Division. The fuel is stated to have a kerosene base:—

- It will start easier than gasoline.
- Leaves no residue of carbon, soot, etc.
- Explodes at temperatures below zero,
- Is capable of greater mileage per gallon than gasoline.
- Safe against premature explosion, igniting only from spark or flame.
- Its combustion requires less oxygen than gasoline.
- Can be manufactured for less money than gasoline.

ECONOMIC NOTES.

AGRICULTURAL.

Ring Disease of Potato.

The Department of Agriculture, Bombay, have issued the following leaflet (No. 8 of 1918) on the ring or Bangadi disease of potato:—

In nearly all the potato growing tracts of the Deccan and the Bombay Karnatak, one of the most important diseases of the potato crop is the ring disease, known to the people as *bangadi* or *chakri*. The present leaflet describes the symptoms of the disease and the methods which should be adopted to prevent attack by it.

Symptoms.—In the fields the disease is easily recognised by the sudden withering of the plants. In the early stages of attack, only a part of the plant withers, but the withering later on extends to the whole plant. Such affected plants turn brown and dry up. In places where the disease is very bad, a considerable number of such dead plants, either scattered or in patches throughout the fields, is a common sight. If the tubers of an infected plant are cut through, some of them at least show a brown ring in the interior at a little distance from the surface. The name of the disease is derived from this character. On squeezing such a cut tuber slimy drops of liquid, creamy yellow in colour, will ooze out from the brown ring. This liquid contains myriads of microbes or bacteria which are the cause of the disease.

Infection.—The disease is chiefly carried into the crop by using such affected tubers for seed. If the seed potato is very badly diseased, it will rot in the ground without sprouting at all. If it is not so badly diseased, it will sprout, but the bacteria will soon spread out into the plant and cause it to wither. From such rotten tubers and plants the bacteria which cause the disease are carried away by irrigation water to healthy plants which are attacked and killed. It is in this way that the disease is spread in the fields, and a large number of plants are destroyed. In other cases, the affected plants may remain alive till the harvest, but the disease reaches the tubers and remains there in a dormant condition. Infection is also likely from the bacteria remaining in the soil, but under ordinary conditions of cultivation the commonest mode of infection is from the use of diseased tubers.

Rotting in storage.—At the time of the harvest the tubers of the diseased plants get mixed with

those of the healthy ones, before they are carried to the store, and consequently a considerable number of tubers rot. The brown ring in the tuber gradually extends first towards the skin, and on reaching the surface the eyes are blackened and killed and such tubers become useless for planting. It then spreads to the interior of the tuber so that the whole of the potato becomes a rotten mass. At such a stage a slimy liquid containing many bacteria, comes out from every eye of the tuber, in which condition the disease is aptly called "Sore eyes" in some places.

Preventive Measures.—The disease being mainly due to the use of infected seed the preventive measures must be directed firstly towards obtaining disease-free seed and secondly towards stopping secondary infection. The following measures will secure this and keep the disease well under control:—

- (1) Get seed from places known to be free from the disease.
- (2) While cutting the tubers for sets, those that show the ring inside should be discarded and such rejected material should never be left in the fields. Otherwise it becomes a source of secondary infection. It should carefully collected and burnt.
- (3) Whenever a diseased (showing ring) tuber is cut, the blade of the knife gets contaminated with the disease and the sets from healthy tubers get infected when cut with the same knife. In order to prevent this the blade should be dipped in boiling water each time an affected tuber is cut.
- (4) The fields should be frequently inspected and any affected plants seen should be removed and burnt. It is not sufficient simply to pull out the affected plants. By doing so only the upper part of the plant comes out and the root and tubers remain in the soil, and as already stated, these contain the germs of the disease. The longer they are left in the field the greater is the danger of increasing the infection to other plants. To prevent this the affected plants as soon as detected should be carefully dug out so as to remove all their underground parts.
- (5) The places where water stagnates in the fields are generally the most affected. Such places should be avoided or, if possible, be levelled.
- (6) The tubers should be stored in a cool well-ventilated place and should be occasionally examined and those showing signs of rot should be removed.

PRICKLY PEAR AS FODDER.

The following revised Leaflet (No. 2 of 1919) has been issued on the Authority, the Director of Agriculture, Bombay; the Superintendent, Civil Veterinary Department; the Collectors of Poona and Ahmednagar; and Rev. A. Norton, Dhond:—

The combined experience at Dhond, at Poona, and in the Ahmednagar and Poona districts leads to the following statement as to the best and safest methods of using Prickly Pear as a food for the maintenance of famine cattle, and as a nucleus in the maintenance of *mhot* cattle.

Value of Prickly Pear as Food.—Prickly pear properly prepared, in the dry weather, is about two-thirds the value of ordinary green *jowari* fodder, and can be used safely in replacement of a corresponding amount of the latter.

Burning of Prickly Pear for use as Fodder.—There are two methods which have proved successful in preparing the fodder. In both cases an intense hot flame is necessary, and one free from smoke. The fruits should be removed before the pear is burned.

(a) *Method with Blow Lamps.*—Cut the pear in branches from two to four feet long. Hang it on stout iron hooks about five feet from the ground on a cross beam of wood, by one of the joints,—leaves downward,—so that the lowest part will be clear of the ground. Begin burning from the lowest leaf. The heat from the lower thorns burning will soon set fire to the thorns above, and the whole branch will flare up. All the thorns will not be burnt up thoroughly in this way, and the whole will have to be gone over with the lamp, working upward, to burn what is not properly burnt. Then it will have to be looked over once more to get rid of any stray thorns which have escaped notice.

This is the best way of burning the Prickly Pear, but lamps are now difficult to get and very expensive, while they are liable to get out of order quickly under village conditions.

(b) *Method of Lohar's Forge.*—An ordinary lohar's forge can be used almost equally well for burning prickly pear. In this case the fire is fixed, and the pear in suitable-sized branches about two feet

long, which should not be too straggling, is held with the lohar's tongs in a sloping position over the flame of a well-blown-up forge. The thorns will catch fire, and those on the upper parts will flare up as when the lamp is used. Then the branch is turned over and the other side burnt in a similar manner. If any thorns remain, as for example at the place where it was held by the tongs, the branch must be held over the fire till all are burnt.

As blow lamps are almost unobtainable, the lohar's forge is probably the best method for general use this year. It should be fixed up, if possible, in a shed protected from the wind.

Preparation of Burnt Prickly Pear :—When the pear is burnt, it should be rubbed over with a stiff brush or a piece of gunny bag to remove any fine thorns and hairs remaining. Then it should be cut up either with choppers on a log of wood, or with a chaff-cutting machine. When animals are first fed with it, the cutting should be to very small pieces, but, later, the pieces may be up to one or two inches square.

Systems of Feeding Prickly Pear :—The animals should be gradually accustomed to the food, otherwise it may lead to purging or to tympanitis, as in the case of other green fodders.

The following is a good method of using the prickly pear.

(a) When the animals are new to this fodder, the following ration should be used:—2 pounds prickly pear with $\frac{2}{3}$ pound cotton seed, linseed meal, or any oil cake. This should be given three times a day (making 6 pounds prickly pear and 2 pounds of the other food per day), for the first week. This requires to be supplemented with three pounds of dried grass or *kadbi* per day.

(b) After the first week, the prickly pear ration may be increased to from eighteen to thirty pounds per day, according to the size of the bullock or cow, and to the succulence of the prickly pear. Along with this, at least half a pound of dry food, preferably cotton seed or oil cake, should be mixed and given every day. A little grazing or, in its absence, about three pounds of dried grass or *kadbi* should be given if possible, as an addition to the above ration. It is advisable to give a little salt. Animals in cattle camps should have some exercise, and be watered twice a day.

Mr. Norton has found at Dhond that, after cattle have been feeding on the above ration for some time, they will thrive on prickly pear alone.

Demonstration.—It is advised that any one wishing to use this method of feeding should visit a centre where the use of prickly pear is in operation. At present it can be seen and shown at the following places:—

(a) The Poona Agricultural College Dairy, near Mariai's Temple, Kirkee.

(b) Rev. A. Norton's Farm, Dhond, District Poona.

(c) Ahmednagar (under the control of the Collector of Ahmednagar).

No doubt more centres will shortly be inaugurated, and information as to these can be obtained from the Collectors of each district.

Treatment of Animals becoming sick.—In the event of any animal suffering from tympanitis, purging, or indigestion from this food, a dose of sweet oil (from half a bottle to a bottle) should be given, and another diet substituted for the time being. In cases of severe tympanitis, the Veterinary Department will be very pleased to give every assistance.

If any animal appears distressed, or any salivation noticed, the tongue and mouth should be examined, and if any thorns are found, they should be removed.

SERICULTURE.

Utilization of Indian Silk.

Mr. R. C. Rawley's Report.

The report on an enquiry into the utilization of Indian silk in Great Britain and France by Mr. R. C. Rawley, investigator in industrial economics, has been published. This is a highly technical publication and is divided into three parts. Part I deals with the British silk industry. A picture of silk industry in England and Scotland has been given to show the nature of its products, and to define its main branches. Each branch of the industry has been taken into consideration with a view to find out the quality and the kind of raw material used in it. The weaving branch of the industry has been discussed first and has been shown how far Indian raw silk could be introduced into the market to satisfy the demand of the manufacturers. The principal defects found in these silks have been pointed out to indicate the importance of a good raw silk and to show that if these defects were remedied there would be a great demand for these silks in this country.

Several outlets have been pointed out for raw silks of comparatively inferior qualities. The spinning branch of the industry has been explained in detail. A thorough enquiry has been made into the utilization of different kinds of wastes in spinning. The defects which render Indian wastes useless in some cases have been pointed out and improvements have been suggested. It will be interesting to note that the commercial value of Indian wastes could be greatly increased if due attention were paid to their collection and packing. A chapter has also been devoted to Indian wild silks. The possibility of increasing the export of Tasar and Eri has been discussed in this chapter.

Part 2 deals with the French silk industry. The subject has been treated on practically the same lines as the above. The difference lies in the different aspects of silk industry in France. In addition to weaving and spinning there we have the production of cocoons and reeling. This opens another channel for Indian cocoons and attracts our attention. In this section a description of the Lyons conditioning house has also been given and various processes of testing and sizing have been briefly explained. The great commercial utility of this institution has been pointed out in order to give an idea of the benefits the French silk trade derives from it.

Part 3 deals with the important problems of prices, consumption and commercial organization. Mr. Rawley also deals with the question of the control of silk trade in India. Two practical methods may be mentioned here. The first is the system of state control under which the industry is entirely controlled by the Government and the export trade is conducted by the Officials of the State. The system is at present practised in Kashmir where the State controls the production of raw silk as well as its export trade. The system appears to be quite satisfactory and the State undoubtedly receives a large revenue from this useful industry, but there are certain hidden discrepancies which show themselves after a number of years. The producer is never wholly satisfied. In some cases he works under compulsion. Even in a perfect organization the State cannot do justice to individual merits and the result is that some of the workers do not devote themselves to their work in the same spirit as they would if they were working independently. Moreover there is another serious objection to the system of state control. This is the ultimate effect of this system on private enterprise. An industry flourishes most when each and every member engaged in it has certain responsibility and pays full attention to its development. This is not possible under strict state control. The spirit of private enterprise should be cultivated and developed in India so as to widen

her resources of raw silk. If the production of silk and its export are under state control there is no possibility of giving an impetus to private enterprise.

The second system that may be safely advocated is that of private enterprise aided by state capital. Leading capitalists interested in the industrial development of the country should be brought together to realize the importance of the project and a company should be formed to take charge of the export trade in raw silk and waste silk. As in every other new enterprise there is always an initial shyness and fear but as the prospects begin to appear brighter and encouraging the resolution becomes firmer and more determined. If this enterprise is backed up by state capital there is no reason why the scheme should not turn out successful. A large amount of capital is required to carry out the project and it is, therefore, necessary that the state should take an active part in its working. It must be remembered that a revival of the Indian silk industry means that there is a tremendous task before the country and so long as the industry is in the stage of infancy state help of some kind is essential. It is not merely a matter of local development but a matter that involves world competition. The production of silk in France, Japan and other countries is backed by state bounties and the interests of the industry are guarded by the state. In so far as India is concerned financial help by the Government would go a long way and the industry would develop more quickly than if it were left to mere private enterprise. With regard to the export of raw silk and waste silk it is advisable that a corporate body be formed in India to control the collection, grading and shipping of these commodities. This body may be called the Indian Silk Association. The great advantage of this corporate body would be that it would be in touch with the British Silk Association, the Silk Association of America and other similar bodies in other countries. It would represent India's silk interest and would be a medium of general information about the silk trade of the world. This form of control, in my opinion, is beneficial not only to India but to England as well because it involves identity of interest and shows a spirit of mutual help. Considering the present situation of the world's silk trade immediate steps should be taken to develop Indian silk resources. Private enterprise coupled with financial help from the Government would make the industry stable and open new channels for Indian silks. The present opportunity is promising and if steps are taken to organize the industry and the trade before it is too late, there is every possibility that India will play a great part in the fulfilment of England's silk contracts after the war.

INDUSTRIAL USES OF ELECTRICITY.

It may not be generally recognized as a fact of Nature, writes Sir Oliver Lodge in the "Observer," but the production, distribution, and utilization of power is necessarily one of the most vital interests of mankind in the material sphere of things. Our sole physical activity is the movement of matter. By that single activity we construct our houses and furniture, our ships and locomotives, our roads, bridges, and engineering works; we also depend on this one faculty for the cultivation of land, for the production of food and fuel, and in general for providing the forces of Nature with the conditions under which they can operate in the directions required by the needs and comforts of mankind.

Human muscles in the first instance were called upon for the preparatory, stimulating and essentially co-operative work whereby the forces of Nature when properly understood could be controlled, harnessed, and directed in accordance with human wishes. Muscles are now supplemented by innumerable engines, of which two classes, heat engines and electric engines, are chief. The more civilised the country the greater is the proportion which mechanical power bears to merely mechanical human labour; and the higher accordingly can be the remuneration or wages per head. Human muscles are well adapted for displaying or demonstrating ideas, but they are not the right means for propelling machinery nor for shifting or raising loads. Unskilled labour should gradually be superseded as we rise in the scale. For irksome and monotonous tasks we can utilise wind and water power which otherwise would be running to waste; we can draw upon the store of energy in coal and oil fields; we can employ the past or present radiation of the sun.

Our chief source of motive power at present is combustion, utilised by aid of the steam-engine or by internally-fired engines: and the power thus generated can be transmitted to considerable distances by means of electricity. Or, if intense heat is the ultimate object, chemical energy is transmissible over fairly considerable distances in the gaseous form, in which form it can be burnt just as and where and when it is wanted. Thorough control is always essential to economy.

Hitherto our methods of utilising natural power have been dirty and wasteful. We have been content to dig up coal in enormous quantities, transfer it to a distance on lines of rail, cart it to its destination, and there burn it crudely and ignorantly and incompletely, so as to be troubled not only with dusty ash, but with the more volatile products of incomplete combustion let loose into the atmosphere. The result has been that the great majority of the English race now live under a perpetual pall of thin smoke; to which indeed, they get accustomed, but which undermines their health and lessens their vigour.

In Elizabethan and other great periods of English history the towns were not big and the atmosphere was clear. This fact should be realised when reading history. True, the less said about the drainage system of our ancestors the better—we have learnt a great deal about sanitation since then, and we have applied much of our knowledge—but we still turn the excrement of our furnaces into the common atmosphere, and thereby foul our lungs in a way which is both senseless and extravagant as well as unhealthy.

What is the remedy? First to deal with coal as what it is, a great admixture of valuable hydrocarbons, many of which are far too good to be merely burnt; these can be separated out and employed for chemical and agricultural purposes, so that only the refuse gas and coke shall be left for burning. And these residual products can then be burnt completely and cleanly. That is the first step. Next, we must realise that solids do not travel freely, nor can they be conveyed so easily as gasses and liquids; these can be much more readily transmitted to a distance; while as for the travelling power of electricity, it is so extraordinary as to have become proverbial. It is literally as quick as lightning.

Coal itself should not be sent on journeys; it should be dealt with chemically, in suitable retorts, at or near its source, in a way which is becoming well-known now to gass engineers. Gass can be transmitted through pipes to centres of population for the production there of easily manageable heat, without encroaching on town area for the erection of unsightly corporation gas works. Electricity can likewise be generated and distributed for purposes of convenient and healthy power and light.

To carry out the generating and distributing system economically, overlapping of many conflicting interests must be avoided; hence it must be done on a large scale. To this end the unit of local self-Government must be a large one. Devolution of much central business to large provinces has often been advocated, as getting free the central Parliament for Common wealth or Imperial ends. Such

dignified provincial Senates will undoubtedly come into existence sooner or later, and the urgency of the need for effective power distribution will probably hasten this reform. The conditions of average human existence hitherto have really not been reputable, considering the amount of knowledge now available if it were effectively used. When the country has adopted a well-thought-out plan for the scientific use of fuel, instead of the present crudely barbarous method of flinging lumps on to a fire, everyone will be amazed and rather chagrined that it was not adopted long ago. It seems likely that half the need for crowding people in factories will then disappear. With easy power that can be switched on and off, home industries in modified form may perhaps revive. In the old days Sheffield cutlery was produced by small workers living by the side of a stream. The conditions of home labour were not ideal in many respects, but they were human, and permitted individuality and some kind of family life.

Why is distributed power, whether chemical or electrical, so handy? Because electric power and gaseous fuel lend themselves to regulation by the turning of a tap—"perfect control" and "economy" are almost synonymous terms—and when all the other improvements which we owe to the nineteenth century are incorporated with this great overdue improvement, surely human life will begin to emerge from that dull, depressed, and discouraging condition which now characterises so much of it. May it not be this which is at the root of a good deal of the labour discontent? Indeed, it is doubtful if those workers who return from the varied, adventurous, though dangerous life at the front will be content to immerse themselves in the old unamended factory routine.

It may seem a small thing to have heat, light and power economically and conveniently laid on to every dwelling and small factory, but it is a big thing in reality. The difference between living in clean healthy air, through which the sun's rays can penetrate—not only the heat rays, but the health giving, bronzing, disease-destroying rays for which we go to the seaside—this alone will have an elevating effect on the spirits of adults and an untold effect on the health of children. For children have not had time to get acclimatised to evil surroundings; they die in large numbers, and through their deaths the population is restricted in the saddest and most wasteful manner.

Life, more Life, is what we must aim at, not mere existence, but life, clean air, healthy surroundings, are its essential conditions. Hours of monotonous toil must be reduced, leisure for higher work must be gained; and with an untruncated

system of education it may be hoped that widespread happiness will result. The depopulated country may become full and interesting once more. Given the easy distribution of light and power, there is no need for people to crowd into close-packed dens and pay exorbitant rents for the privilege of living near their work. Distribution rather than concentration of the people can begin.

It may be urged—on the score of expense and limitation of material—that a conductor better than copper is desirable; perhaps ultimately such a conductor may be necessary. Well, who can say that it will not be forthcoming? If a metal is kept sufficiently cold it will transmit an electric current with hardly any loss of energy. A perfect conductor is not physically impossible. Impractical on the large scale as yet; yes. But when science gives us a hint like that we should receive it with avidity, give it our best attention, and look out for some way of utilising the fact in practice. We do not yet see how. No, but many things thought impossible have turned out feasible enough in the long run. If only the State would encourage lavishly, first, pure science, secondly, the applications of science, corporate life both in town and country might be revolutionised in a generation. Already messages and correspondence are distributed, with splendid organization, by telegraph and post. Distance has thereby already become comparatively unimportant.

Among the reconstructions made possible by the war—made possible by the opening of men's minds to larger possibilities of utilising the already made discoveries of science—let us see to it that potential light, heat and power are generated in the most economical fashion, wherever the raw material is readily available, and let us utilise the travelling power of electricity to the utmost.

INDUSTRIES AND COMMERCE.

United States Government's Commercial Intelligence Service.

An urgent appeal for an expansion of the United States Department of Commerce to meet the demands that will be made upon it, says the *Board of Trade Journal*, as soon as the war is over, has been made by the Chief of the Bureau of Foreign and Domestic Commerce of that Department in an address before the Convention of the American Manufacturers' Export Association at New York.

"There are only eleven American commercial attaches," he stated, "because funds for more do not exist. Our new estimates call for eighteen."

"Instead of being content with thirty travelling agents covering the entire world, as last year, we are asking now for thirty in Europe alone (when the war is over), and as many more in the Far East and South America."

"Our foreign technical service must be reinforced and organized by a force at Washington that can test the work for scientific accuracy, unify it, tabulate it for comparison with previous data, attach correct conclusions, and put it into readable form for merchants. The Bureau should have for this purpose highly competent statisticians, economists, commodity specialists, Customs experts, shipping advisers, and so forth; without them the authority and helpfulness of the Department of Commerce fails completely. Men of such grades receiving decent salaries of three to six thousand dollars are allowed to the regular Government commissions and to some of the War Boards, whereas we are restricted to salaries around eighteen hundred for some of our best research men. As a result the bulk of our work falls upon overworked division administrators who tire out and leave us."

Eventually the Convention was informed that the Department of Commerce should have added to it a Bureau of Industrial Practice that would aid in eliminating waste in man power, time, material, and overhead cost; also a Division of Material Valuation, for studying the original sources, the handling, and the grades of foreign and domestic materials, a Division of Information on Internal Water and Railways, a Division of Distribution Economy, and a Division of Cost Finding Methods.

"We at Washington," he explained, "are not so lost in the details of our daily routine that we do not frequently lift our eyes to the commercial horizon and see new developments in prospect. The main purpose back of our daily work and our plans for the future is just this: We want to give the commercial public a steady flow of trade and industrial information, comprehensive, straight to the point, and usable. Nor should it fail to deal with every phase of business where there is a fundamental problem. Without such helpfulness and advice our business interests may be outstripped by European operators. For we know that the European manufacturer and merchant, under the spur of war needs, has acquired habits of scientific management that have made him more efficient than ever before. During the last four years he has been forced to measure with sensitive scales his scanty resources in men, materials and time, and certainly our own producers must observe the same rules of scientific precision if they hope to hold their own in competition. There is not the slightest doubt of our ability to meet all comers on an equal basis if we add to our natural energy and ingenuity a determination to be guided by facts properly ascertained and explained. No agency is better able to discover and collect the facts than the Department of Commerce."

CO-OPERATION.

Russian Co-operation during War Time.

The *Russian Co-operator* in an interesting article on Co-operation in Russia during War time says:—

In attempting to present some account of the activities of the Russian Co-operative Movement during the War in the space of a short article, I find it necessary to abandon the idea of giving anything like a complete summary. The subject matter is too immense to be thus condensed; it would be like trying to draw a picture of the world War on the page of a pocket book. Russia itself is so vast, its Co-operative Movement is so complex, it differs in so many material respects from Co-operation in Great Britain, that only confusion would result from trying to depict so great a drama on so small a stage. Moreover, the war has not only blurred the perspective of all things Russian, but the incalculable Revolution has also thrown the wreckage of war into the melting pot, and from that crucible no one may yet say what base metal or pure gold will finally emerge. War and Revolution have also had the effect of so hindering communications, both postal and telegraphic, with Russia, that information is often months old before it reaches this country, making it difficult to speak with any certainty of the latest co-operative developments. I must perforce, therefore, be content, as it were, with just throwing on the screen a few disconnected pictures of Russian Co-operation during war time; the full story can only be told when the fog of war and the smoke of revolution have entirely lifted from the race of Russia.

Co-operative organizations in Russia have shown during the war an adaptability to changed and changing conditions, which speaks volumes for the future of Russian Co-operation. The test of whether an organism is really alive or whether it is a mere piece of machinery lies in its ability to adjust itself to any modifications of environment. A machine can only do what it is made to do. A living thing can become master even of inimical surroundings. Now, Co-operation is essentially a peace activity. It pre-supposes peace for its very existence. War and all the insecurities arising out of it are anathema to Co-operation. And yet Co-operation has not only survived war, it has grown stronger during its course. If it had been merely mechanical it would have ceased to function under the changed and adverse conditions. For instance, I have before me the figures of the turnover of the Union of Siberian

Creamery Associations from 1914 down to the middle of November, 1917. Butter making is the main industry of this Union, and I find that there was a progressive increase during those first four calendar years of the war which is almost startling. In round figures the butter sold in 1914 was seven million roubles, in 1915, 16 million roubles, in 1916, 58 million roubles and during ten and a-half months of 1917 the value of butter sold exceeded 103 million roubles. Cheese, which, comparatively speaking, has been an unimportant side line, although there may be great developments for this in the future, showed a decrease, however, from 663,839 roubles in 1914 down almost to the vanishing point in 1917; but under the heading "Various Implements and Goods Supplied," there was an increase from 663,539 roubles in 1914, to 1,779,706 roubles in 1917; while under the heading, "Various Goods Supplied from Warehouses," the figures jump from 7 millions, to 19 millions. Similarly with such commodities as "hay, meat, pork, fat, etc.," the increase was from 4 millions to 9 millions.

With the progressive rise of price, however, the rouble has been a uncertain method of comparison, and, lest it may be thought by some that these increases are entirely illusory owing to the decreasing value of the rouble, it may be pointed out that whereas in 1915 the Union supplied the Army with 983,441 poods of butter (a pood equals 36 lbs.), in 1916 this was increased to 2,942,307 poods. The following comparative statement of supplies of all kinds to the Army is also interesting:—

During 1914	...	...	4,27,4000 roubles
During 1915	...	...	17,344,000 ..
During 1916	...	...	62,470,000 ..
Up to September 1st, 1917.			115,011,000 ..

The Union's return from which these figures are taken also speaks of some of its manufacturing enterprises, either actual or contemplated. Among the former are soap works, a butter factory, rope works, and a cooerage for the manufacture of butter tubs; while contemplated enterprises include a tannery, a boot factory, a spinning mill, and a factory for the manufacture of printing materials. Admitting that contemplation is not realisation, the bare-fact that such enterprises should even have been considered in war time shows an awareness of after-war possibilities which is at least encouraging in the outlook for the future.

The following table shows the turnover of the Union from 19th October, 1916, to 1st May, 1917, or, roughly speaking, six months:—

Butter	...	...	27,347,108 roubles.
Cheese	...	...	220 ..
Tallow, Pork, and other products	...	...	9,377,658 ..
Various materials for Butter produce	...	...	631,858 ..
Goods for Artels shops	...	...	8,432,594 ..
Printing	...	...	58,236 ..
Total	...	...	45,847,664 ..

The Moscow Union of Consumers' Societies (now the All-Russian Central Union) has also made great strides during the war. The rapid progress of this organization is shown by the fact that whereas in 1909 the Union comprised only 300 societies, with a turnover of £200,000, the number of societies included in the Union had by the end of 1916 increased to 3,000, and the turnover to £9,000,000. In 1917 the Union also established a foreign buying office in London, right in the centre of the world's produce exchange. War conditions, shortage of tonnage, the closing of ports, Governmental restrictions upon imports and exports have, of course, greatly hampered the work of the London buying office, but the mere fact of establishing a foreign buying agency during war time is sufficient evidence of energy and foresight. Even before the London agency was opened, that is: during the first six months of 1917, the Moscow Union had from its central offices in Moscow arranged for the import from abroad of large quantities of rice, cocoa, coffee, pepper, spices, and textile goods, and with the London buying centre now established, once war restrictions are removed, and when Russia is again in a settled state, the developments in this direction give promise of being immense. Even in 1916 the Union imported about 40 per cent of all the herrings which were brought into Russia, and in 1917 the Union was the biggest Russian importer of coffee and rice, facts which speak for themselves.

Readers of the "Russian Co-operator" have quite recently been made familiar with the operations of the Union of Siberian Co-operative Unions, "Zakupsbyt" (Purchase Sale) so that it is unnecessary to deal with this to any extent. But its remarkable progress may be seen at a glance from the following figures of its turnover in different months of 1916 and 1917:—

July	1916	...	77,458 roubles.
August	"	...	290,820 ..
September	"	...	590,761 ..
October	"	...	617,270 ..
November	"	...	670,648 ..
December	"	...	1,102,763 ..

January	1917	... 1,145,380 roubles.
April	"	... 1,881,564 "
July	"	... 2,996,578 "
October	"	... 3,863,994 "
December	"	... 8,955,464 "

I now come to the Moscow Narodny Bank, which I have left to the last, not because it is the least important of the great Russian co-operative organizations, but because its prosperity and progress largely depend upon, or, at least, must be intimately associated with, the general success of the whole co-operative movement of Russia. A co-operative bank, especially upon the large scale of the Narodny Bank, would be almost unthinkable without a co-operative movement to provide it with the atmosphere, so to speak, of its existence. And, while the Bank itself is a source of strength to its allied co-operative concerns, it could not flourish unless these flourished also. And from the fact that co-operation generally has made progress in Russia during the war, we may rightly, draw the conclusion that the possibilities of co-operative banking development have increased proportionately. I do not intend here to go lavishly into figures as to the Narodny Bank's increasing prosperity, but I may mention one or two significant and symptomatic facts concerning its activities. When the Bank opened its office in London it was only as a buying agency for the central establishment in Moscow and during the war it has been one of the main arteries for the import into Russia of seeds, insecticides, fungicides, binder twine, and other agricultural requirements, the value of the goods thus handled by the London office of the Narodny Bank during the first eight months of 1917 amounting to over £98,000, a sum which would have been vastly exceeded but for export restrictions and scarcity of tonnage. In addition to such activities, the London office has recently opened a financial branch for accepting deposits, opening current accounts, and transferring money to and from Russia. This last item will probably prove to be the most important of its purely financial activities. Two considerations make this probable. First, London is the financial centre of the world. The part it plays in international trade is colossal. If co-operative Russia is therefore to operate on a large scale as importers and exporters the existence of such a financial organization in London is essential. The second consideration is that the Moscow Narodny Bank has been recognized by the Russian Government as an important agency in the work of conducting foreign trade and in its purely co-operative capacity the Narodny Bank is interested in exporting from Russia, tar, pitch, turpentine, timber wool, bristles, eggs, frozen meats, and dried fruits; and, with regard to imports, is similarly interested

in pig-iron, steel, wire, iron plate, as well as the purely agricultural commodities previously mentioned. The production of timber and flax in Russia are also rapidly passing into co-operative channels, and the Moscow Narodny Bank will doubtless play an important part in financing the export of the goods.

Readers of this very incomplete and partial survey must bear in mind that Russia, in the industrial sense of the world, is, comparatively speaking, a young country. But it has been violently convulsed both by the war and the Revolution, and when these disturbing influences cease to produce their effects, when transport becomes fully restored, when industry springs up Phoenix-like from the ashes of an old and destroyed order of things, when education begins to penetrate to the remote villages and hamlets, the ferment will have its effect, and the best judges confidently assert that Russia will take great strides in the coming triumphs of civilisation. And if so much of co-operative effort has been possible in the industrial infancy of Russia, if, despite the war and despite the subsequent chaos, co-operation has held its own and even made progress we may rest assured that in the future civilisation of Russia the co-operative movement will play a worthy and a leading part.

BANKING AND FINANCE.

Land Bank of Egypt.

Apropos of the discussion on a Land Bank for Mysore, the following report of the directors of the Land Bank of Egypt for the year ended September 30, read at the general meeting held in Alexandria on December 3, will be read with interest:—

Continuing to enjoy, under the British Protectorate, favourable conditions such as no other belligerent country has known, Egypt's economic position has been maintained and improved. A succession of favourable Niles has enabled the land to yield varied crops, the price of which has reached a level hitherto unknown. The wise measures taken by the Government have reduced the cultivable area reserved to cotton, the principal export, but have had the truly gratifying result of developing specially the production of the cereals necessary for feeding the people and of inducing the cultivator to redouble his efforts to produce commodities of prime importance, avoiding also, as far as possible, the dangers of an undue concentration upon one crop. The

cotton crop exceeded 6,300,000 quintals (Kantros), and the price obtained gave the produce on excellent return, despite the increased cost of labour and of certain indispensable materials, such as fuel. The total value of that crop was considerably more than £50,000,000. The position of the Land Bank of Egypt, closely connected with that of the landed proprietors, has naturally been affected by the prosperity of the country. Receipts in cash have been exceptionally high; in view of the state of our finances, we have thought advisable to repay to the Credit Foncier Egyptien the advance which that establishment had granted us in 1913 until the circumstances permitted an issue of shares. In using certain of its powers of disposal for the transfer of funds to Europe, by the advantageous state of the exchange or for investment in Government loans, easily realisable, the company has not been unmindful of its chief purpose. It has closely followed the resumption of transactions in mortgages, already begun last year, and has concluded a certain number of loans, observing, notwithstanding the marked rise in land values, the prudence necessary in the valuations of the securities offered. These loans number 91, for a sum of £431,135,099, which, added to the existing loans and to our realisations by sales, brings the total of our transactions guaranteed by mortgage on vendor's privilege, to £3,455,675,675. Our annuities in arrears have been reduced from £378,501,032 to £216,184,950, of which £90,775,853 are arrears correctly so called, and £125,409,105 are loans maturing during the year. The settlement of our property continues in satisfactory conditions, and, thanks to favourable circumstances, our account "real property expropriated" has fallen from £222,974,330 to £143,100,024. While continuing to set aside interest of which the recovery appears uncertain, the profits of the year are increased to £326,997,576, against £323,062,263 for the last year. Our general expenses are increased in consequence of the necessity for improving the position of our staff, who have shown great devotion to our interests, in granting them supplementary allowances. Various charges, such as general expenses, sundry taxes, etc., give a surplus of receipts on expenses of £148,573,020. Your board proposes to strengthen the bank's position in the following manner:—(1) Provision for the amortisation of debentures, premiums, and charges, £13,528,681; (2) amortisation of real property, movables, and brokerage on mortgages, £5,409,578; (3) provision for risks on loans and the amortisation of the property, £21,000, or a total of £39,938,259. The net profit of £108,634,761, to which is added the balance from the previous year, will allow of the distribution

of a dividend of 8s. 6d. per ordinary share and of £3 on the founders' shares. In expressing to those members of the staff in the Allied Armies our wishes for their happy return after the victory, definitely obtained to-day, we take the opportunity of thanking their colleagues who have assisted us with the greatest devotion. In the course of the past year we have had the sorrow of losing our president, M. Jules Charles Roux. You know the very important place he held in business circles. President or director of leading financial houses, he applied to his varied interests his unrivalled intelligence, his experience of men and affairs, and his energies. At the same time his kindness and courtesay made him one of the most notable and most appreciated personalities of our time. Director of our company from its foundation, he became its president in 1912, and since that time he followed more and more closely the development of our business. In honour of his memory your Board has set aside a sum for the award of 300 francs each year to the children of a sailor of the French mercantile marine who has died in the pursuit of his duty. We are confident that this meeting will decide to give us its support in this act of remembrance. To the family of our president we express our heartfelt regret and condolences. Associated with him since the opening of our business was our auditor, Mr. A. Gorra, whose loss we also have to deplore. He fulfilled perfectly the duties with which we entrusted him, and he leaves behind him the memory of a good man.

MYSORE ECONOMIC CONFERENCE.

INDUSTRIES AND COMMERCE COMMITTEE.

Half-Yearly Report of Work Done.

The following is a brief Report of work done during the half-year ending 31st December, 1918:—

I. Important Schemes Under Operation.

1. THE MYSORE DASARA INDUSTRIAL AND AGRICULTURAL EXHIBITION OF 1918.

The Government in their order No. 9136-85/A. & E. 47-17-39, dated the 13th March 1918, having directed that the Dasara Exhibition of 1918 be thrown open to the whole of India, the All-India Exhibition was held from 12-10-1918 to 28-10-1918 as per programme previously issued. It was opened by His Highness the Yuvaraja, Sri Kantirava Narasimharaja Wadiyar Bahadur, G.C.I.E. On the

occasion of the opening ceremony, Mr. A. R. Banerji, C.I.E., M.A., I.C.S., President of the Exhibition Committee, delivered an interesting and instructive speech in the course of which he reviewed the activities of the State in Industrial and Commercial matters in the light of those of other countries having similar conditions like Egypt and of those of more advanced countries like France and Italy. He also touched upon the reconstruction policy proposed to be adopted in these countries.

A course of lectures by eminent men and demonstrations by experts had also been arranged during the Exhibition period.

In spite of railway transport difficulties a large number of exhibits were received from different parts of India and some Native States. Many of the State Departments co-operated with the successful working of the Exhibition by sending useful exhibits and by arranging for practical demonstrations. The total number of visitors was above 30,000.

2. DEVELOPMENT OF RURAL AND MINOR INDUSTRIES.

The Sub-Committee for the consideration of the above subjects met on the 14th December 1918, and passed certain resolutions which will be placed before the Central Committee for final consideration.

The Sub-Committee have emphasized the need for a Special officer to look after the development of Minor Industries and Commerce in urban and rural areas.

3. MANUFACTURE OF LAC-DYE AND VARNISH.

In February 1918, Government sanctioned the establishment of a small experimental factory for the manufacture of Lac-dye and Varnish as per scheme submitted by the Department of Industries and Commerce. The Director reported that owing to Railway transport difficulties no lac could be had from outside and as such the industry could not be started till now. In October last, a copy of the press communique issued by the Government of India re an improved method of cultivating lac, was referred to this Committee for opinion. The question of developing the industry is being investigated in consultation with the Conservator of Forests.

4. ESTABLISHMENT OF MODERN HINDU HOTELS IN TALUK AND DISTRICT HEAD-QUARTERS.

(a) *Bangalore Hotel*.—The concessions granted to the proprietor of the Bangalore Hotel ceased from 5th November 1918, and Government have extended the lease of the present building on certain conditions for four years more. The hotel is a very popular and an useful institution. From July 1918, up to the end of the year 496 persons have put up in it. It is

gratifying to note that people have commenced to stop in it with their families also.

(b) *Mysore Hotel*.—This hotel is equally popular and useful. The total number of persons put up during the period under review is 328.

(c) *Chikmagalur Hotel*.—After the inspection of the concern by the Secretary to the Industries and Commerce Committee, the subject of granting further concessions to the Hotel was considered by the Committee, which at their meeting held on 25th September 1918, recommended the grant of (1) A house rent of Rs. 25 per mensem for one more year from 1st July 1918, and (2) a loan of Rs. 500 for the purchase of necessary furniture required for the Hotel on proper security. The recommendations made by the Committee were sanctioned by Government in their order No. 4750-1/M. 96-18-6, dated 2nd December 1918. From July last 120 persons have put up in this Hotel till the end of the year.

(d) *Tumkur Hotel*.—The following concessions recommended by the Committee were sanctioned by Government to Mr. Venkatasamy Iyer of Tumkur who has been working the concern since 15th July 1918.

(1) A loan of Rs. 500 on proper security repayable within a year at 4 per cent interest per annum,

(2) A monthly grant of Rs. 30 for one year, and

(3) an advance of Rs. 600 for the purchase of furniture, etc., free of interest and repayable within three years, the articles to remain the property of Government till the repayment of the advance.

The affairs of the concern are being supervised by a local Sub-Committee. 120 persons have stopped in the Hotel during the period under review.

(e) *Kadur Hotel*.—Certain concessions sanctioned by Government in their order of the 21st March 1918, in favour of Mr. Venkataramaniah Chetty were not availed of as the party was not able to furnish proper security for the loan. A fresh application received from another candidate is under the consideration of the Committee.

On a report by the Secretary, Industries and Commerce Committee, Government passed an order on 17th September 1918, prohibiting the sale of liquor in the State-aided Hindu Hotels.

5. TAILORING.

The candidate deputed from Kadur District to Bombay for practical training on a scholarship granted by the Committee returned after completing his course, in last June. The Committee are watching how far the training acquired by the student will be useful to him in his future career. Pending the receipt of definite information regarding the student, the question of granting further scholarships has been deferred for the present.

6. GRANT OF TAKKAVI LOANS FOR INDUSTRIAL PURPOSES.

During the period under review, the following loans were sanctioned by Government on the recommendation of the Committee :—

1. A hire purchase loan of Rs. 18,000 to Mr. K. Narniah of Kolar for starting a Rice Mill.
2. Loan of Rs. 6,000 under, hire purchase system, to Mr. Jungappa of Mysore for improving his Rice Mill.
3. Loan of Rs. 10,000 to Messrs. Thimma Bhat and Ramakrishna Bhat of Tirthahalli for enlarging their Rice Hulling concern.
4. Loan of Rs. 10,000 to Mr. H. Rangaswami Iyengar of Mysore for starting a brick factory.
5. Loan of Rs. 20,000 to Mr. A. Ramanna for starting a Rice Mill.
6. Loan of Rs. 13,600 to Mr. Seshachar of Hole-Narsipur for starting a Rice Mill.
7. An additional loan of Rs. 2,000 to Messrs. Krishna Jois, Siddalinga Chetty and Venkatasubba Chetty of Krishnarajpet for the purchase of accessories required for their Rice Hulling concern.

The following loans were sanctioned by the Chairman :—

1. Loan of Rs. 5,000 to Mr. B. N. Hanumanthappa of Chickmagalur for the purchase of an oil engine.
2. Hire purchase loan of Rs. 4,100 to Mr. Y. Aswathanarayana Rao of Yedatore for improving his Rice Mill.
3. Hire purchase loan of Rs. 5,000 to Mr. M. Subbayya of Magadi for starting a Rice Mill.
4. Loan of Rs. 5,000 to Messrs. K. Gurulingiah and Siddalingiah of Sagar for improving their Tile Factory.

7. DEVELOPMENT OF THE TILE FACTORY.

The Committee recommended to Government the grant of permission to Mr. Mahammadali to take clay from the tank beds free of charge. In the meantime, the Deputy Commissioner, Tumkur District, has recommended the concession being granted to a joint-stock concern instead of to Mr. Mahammadali. The question is yet under the consideration of the Committee.

Mandikal Tile Factory.—The grant of certain concessions prayed for by this factory was referred to the Director of Industries and Commerce for

opinion. The Director is not in favour of granting any concessions to the concern. The subject is pending final decision of the Committee.

8. INTRODUCTION OF RICE MILLS IN PADDY GROWING CENTRES.

On the whole 8 loans were sanctioned to encourage the starting and improving Rice Hulling concerns.

9. COCOANUT FIBRE INDUSTRIES.

As a result of the deputation of two merchants from Tumkur District accompanied by Mr. G. Santhaveerappa, District Economic Superintendent, to Ceylon, Cochin and Travancore, the Government sanctioned to Mr. Hanumantha Gowda of Chiknayakanhalli, a sum of Rs. 5,000 to start a Coir Factory. As the party died before availing himself of the loan, no progress was possible in this direction. The Sub-Committee to consider this question will meet in February, 1919.

10. TRAINING OF YOUNG MEN IN CRAFTS AND INDUSTRIES.

(a) The Sub-Committee to select candidates for these scholarships met on 24th August 1918, as per G. O. No. 5271—5/A. & I. 146-15-2 dated the 24th March 1916. Thirty artizan scholarships were to be awarded for the training of young artizans in workshops both inside and outside the State. The Secretary, Industries and Commerce Committee, had received a large number of applications from the District Economic Superintendents. But as many scholarships as were sanctioned in the G. O. could not be given, since the Director of Industries and Commerce represented at the Meeting of the Sub-Committee that he did not make provision in his budget for these scholarships.

The progress of the six students now undergoing training in Bombay is reported quite satisfactory.

(b) Two students are given scholarships direct by the Committee to study dyeing at Cawnpore. Their progress is satisfactory.

(c) The Inspector-General of Education had sent a note for the consideration of the Committee, proposing that the present artizan scholarships of Rs. 5, 7-8-0, and 10 be increased to Rs. 10, 15 and 20 respectively so that they might attract a larger number of students than they did at present. The Committee approved the proposals of the Inspector-General of Education.

(d) *Scholarship to an Apprentice to Study Soap Manufacture.*—The Committee granted a scholarship of Rs. 25 per mensem for three months with to and fro travelling allowances to a candidate from Kadur District to learn soap making at Bangalore in the Government Soap Factory.

11. FURTHER DEVELOPMENT OF PAINTS.

From the report received from the Mysore Royal Paint Works, it is learnt that the paint works are considerably enlarged of late on the side of manufacture. The concern is reported to be patronised by the several Departments in the State. The paints are said to be popular not only locally but have come to be widely known outside the State. The value of sales effected till October last is shown in the following tabular statement :—

Mysore State.		Outside.	
Government Departments.	Public.	Government Departments.	Public.
Rs. 4,750	Rs. 800	Rs. 1,460	Rs. 1,972

Total value of sales is nearly Rs. 9,000.

II. Schemes Sanctioned but which have to be worked out Further.

1. FURNITURE FACTORY.

The Dewan when he held the merchants' meeting at Bangalore on 20th July 1918, made a reference to the establishment of a Furniture Factory. A number of merchants came forward to start the factory. In the Confidential Responsibility sheet issued by Government on 15th August 1918, the work of establishing the factory was entrusted to the Deputy Director of Commerce and to Mr. Barton.

The Sub-Committee appointed to consider the question of establishing a Furniture factory met twice on 17th August 1918, and 27th September 1918. Though it was largely advertised, it was regrettable that the attendance was very poor. It was proposed by the Convener, Mr. P. A. Barton, that to make the concern a really paying one, the value of each share should be Rs. 5,000. It was resolved that those present at the second meeting should circulate this idea largely among their friends and others who are interested in the concern. Till now no application has been received.

2. THE CENTRAL INDUSTRIAL AND COMMERCIAL MUSEUM.

In their order of the 28th September 1918, Government directed that the Industrial and Commercial sections of the Museum should be separated and placed under the Director of Industries and Commerce and the Deputy Director of Commerce respectively.

The Industrial Museum has been located in the Exhibition premises and the Commercial Museum in Mr. Banumiah's school.

The working of the Commercial Museum is reported to have begun in the month of October. The Commercial Museum has purchased the Japanese exhibits specially got by the Exhibition Committee for the last Exhibition to illustrate the Industries carried on in Japan as "Home Industries" and by women and children.

The Deputy Director now in Burma is reported to have received from Government a grant of Rs. 1,000 to buy Burmese exhibits for the Museum. The report on the working of the Industrial section of the Museum is awaited.

III. Schemes under Investigation.

1. CANNING OF FRUITS AND PREPARATION OF EDIBLES SUCH AS JAMS, JELLIES, ETC.

It is under contemplation to print the lecture given in connection with practical demonstrations by Mrs. Wisner of Allahabad at the recent Exhibition in the form of a bulletin of the Committee.

Further steps for the development of the industry will be considered in the Sub-Committee which will meet in this half-year.

2. DEVELOPMENT OF LEATHER INDUSTRY.

The recommendation of the Sub-Committee which met in December 1918, is deferred pending the receipt of a report from the expert recently appointed by Government to investigate the possibilities of developing the Industry.

3. INVESTIGATION OF THE MINERAL RESOURCES OF THE STATE WITH REFERENCE TO INDUSTRIAL DEVELOPMENT.

The Sub-Committee on the subject met on 10th September 1918. On the recommendation of the Committee Government have recently sanctioned a sum of Rs. 5,000 in the first instance to be placed at the disposal of the Director of Geology for carrying on practical investigations about the occurrence of limestone, etc., which were necessary in common for most of the industries that were desired by the Economic Conference to be started in the State. It is reported that arrangements have recently been made by the Department to conduct experiments in Mandya Taluk.

4. LAUNDRY.

This was another subject referred to by the Dewan at the merchants' meeting held in Bangalore and Mysore on 20th and 5th July 1918 respectively. Mr. Usmankhan came forward to start the industry on certain Government concessions. His application was considered by a Sub-Committee which met on 30th August 1918. The Central Committee to which the Sub-Committee's report was submitted sent back the report for a more detailed one.

In the meanwhile, the Secretary, Economic Conference, sent another application from the same party. This too was rejected and sent back by the Industries and Commerce Committee to be submitted through the proper channel, viz., through the Director of Industries and Commerce and with his recommendations.

5. BANGLE AND GLASS INDUSTRY.

The proposals of the Director of Industries and Commerce to conduct certain experiments in glass manufacture locally with the help of an expert at a cost of Rs. 1,000 were referred to the Committee by Government for opinion. The Committee recommended to Government to approve the proposals of the Director.

6. MANUFACTURE OF UMBRELLAS.

The suitability of the Mysore bamboos for the manufacture of umbrella handles is being tested by the Department of Industries and Commerce and the result of experiment is awaited.

7. INCREASE OF TRANSPORT FACILITIES.

The Kadur District Committee recommended the grant of a loan of Rs. 500 to Mr. Abdul Ravooif Sahib of Mudigere taluk for opening a country cart service. The Committee have referred the subject to the Malnad Improvement Committee who have in their programme, the question of improving the means of communication in the Malnad parts of the State. The Sub-Committee on the subject will meet in the ensuing official half-year.

8. DEVELOPMENT OF PENCIL INDUSTRY.

The Special Forest Officer to whom the subject has been referred for collecting sufficient data has since completed his survey of the different kinds of woods available in the Shimoga and Kadur forests and he is of opinion that Mysore has enough raw material to turn out 500 gross of pencils a day. It is reported that a second hand plant estimated to cost about Rs. 40,000 is available.

9. MANUFACTURE OF MATCHES.

The Special Forest officer who was deputed to Northern India to inspect a second hand match making machinery reported to be available has since submitted his recommendation for the purchase of second hand machinery at a cost of Rs. 33,000 now available at Ellichpur for sale.

The subject will be considered at the next meeting of the Committee to be held early in February 1919.

IV. Collecting and Spreading of Information.

1. FACILITIES TO MERCHANTS TO TRAVEL ABROAD.

Owing to war conditions it was not possible to depute merchants to foreign countries. Now that

the war is over, it is hoped to send a few merchants to Japan to study Industrial and Commercial conditions.

2. PUBLICATION OF BULLETINS.

The Sub-Committee on the subject met on 11th January 1919. It has recommended the publication of a few bulletins and also the mode of their distribution. These proposals will be discussed at the Central Committee Meeting in February.

3. COMPLETION OF STANDARD DEVELOPMENT FORMS.

The compilation of the consolidated figures for the whole State will be taken up as soon as the final figures are received back from the Districts.

4. REGISTRATION OF ROAD STATISTICS.

The subject has been referred to the Deputy Director of Commerce for practical action being taken in the matter. His report has not yet been received.

V. Miscellaneous.

Under the Presidentship of the Dewan a meeting of merchants and others who were interested in the economic development of the State was held in the cities of Mysore and Bangalore on 5th and 20th July 1918, respectively. At both the places "Responsibility sheets" were drawn up showing the names of merchants who came forward to develop particular industries and other persons and Government officers who were held responsible to see that industries did develop. A time limit was also given in these sheets for the completion and starting of schemes.

The following subjects connected with Industries and Commerce were discussed and were promised attention in Mysore and Bangalore.

(a) In Mysore, Industrial suburb, Cotton Mill, Cotton Seed Oil Co., Weaving Industry, formation of a Trading Co., starting a Commercial Club, formation of a Branch of the Chamber of Commerce, Furniture Factory, Boot and Shoe Factories, Brick Factory, Laundry, Power Loom Factory, Up-to-date Weaving Factories, Match Factory, Rug Factory, Woollen Spinning Mill at Mandya, Tannery, Ivory Inlaying Work, City Progress Committee, Publishing a Directory of Industrial and Commercial Firms.

(b) In Bangalore, Oil Mills, Furniture Factory, Wool Spinning Mills, Manufacture of Stoneware Pipes, Rice Mills, Button and Rope Making Machinery, Electric Laundry, Establishment of a small workshop at a central place in the City to assist small concerns, Perfumery Works, Industrial

Workshops, Commercial Club, Handbook of Commercial and Industrial information, Hotels.

2. THE MYSORE CHAMBER OF COMMERCE.

The Committee recommended the renewal of the existing concessions for one more year. The Government have approved of the recommendation.

3. PERIPATETIC BLACKSMITHS AND CARPENTERS.

The blacksmiths and the carpenter whose terms have been extended till the end of the current official year are reported to be doing useful work by way of training local people. The work done by them is as follows:—

Statement of implements and tools newly prepared and repaired by the Peripatetic Blacksmiths and the Carpenter.

Name of District	Blacksmith or carpenter	Names of villages visited	No. of people who received instructions	No. of implements of all kinds newly made	No. of repairs done to the old instruments
Chitaldrug	Carpenter ...	Guntur, Bhimasamudra ...	14	23	...
Do	Blacksmith ...	Siddayyakoti ...	No. not known ...	12	4
Shimoga	Do ...	...	10	22	...
Mysore	Do ...	Ganjam, Kirangue, Makankoppal, Neelamani, Kaithana Halli and three villages.	10	122	...

4. NOTE ON INDUSTRIAL AND AGRICULTURAL CO-OPERATION BY THE REGISTRAR OF CO-OPERATIVE SOCIETIES IN MYSORE.

The note by the Registrar of Co-operative Societies and the Special Committee's recommendation on Hand-loom Weaving Industry were considered by the Committee and their final recommendations were sent up to Government.

5. EXPERIMENTS IN CONNECTION WITH ESTABLISHING A PORCELAIN FACTORY IN MYSORE.

The proposal of the Director of Industries and Commerce to conduct certain experiments at a cost of Rs. 2,500 were considered by the Committee and they have recommended to Government to sanction the Director's scheme.

Government forwarded for the opinion of the Committee, a note on the main principles, practices and methods of work relating to Economic Conference.

The Committee resolved that the Government be requested to forward the proposals said to be formulated by them for making the Conference a permanent body for the opinion of this Committee and that, in case they were not prepared to do so, the Government be pleased to accept certain alternative proposal, given out by the Committee.

M. N. BALA RAJ URS,
Secretary.

AGRICULTURAL COMMITTEE.

Progress Report.

The following is a review of progress for the period ending 31st January, 1919:—

INTRODUCTORY.

The subjects on the Committee's programme were grouped under 12 heads, and Sub-Committees were constituted to deal with each group. Specific items were also allotted to individual members, and a responsibility sheet was prepared.

I. INCREASE OF FOOD PRODUCTION.

The Agricultural Committee were entrusted with the problem of increasing food production and authorised to place themselves in touch with the Central Transport and Food-stuffs Board at Delhi. The Committee investigated the subject and worked out proposals which have since been embodied in Government Orders. The measures recommended included facilities for getting land on favourable terms for temporary cultivation, and the provision of

seed, manure, impliments, and technical assistance by the Agricultural Department.

Settlement of wandering tribes and landless people.—Detailed proposals have been received from the Deputy Commissioners of Tumkur, Shimoga and Chitaldrug and are under consideration. As this subject has to be studied in close touch with local conditions and in consultation with the administrative Departments of Government, progress has been rather slow.

Consolidation of scattered holdings.—At the last Conference, Dr. Coleman drew attention to the economic waste resulting from the fragmentation and dispersion of holdings in the State. A note has been prepared summarising the proposals made to meet a similar situation in other parts of India, and suggesting action on the same lines in Mysore.

II. ORGANIZATION.

1. Model rules have been prepared for the formation of Taluk Agricultural Associations which have to play an important part in the development of private initiative in agricultural matters.

2. The Committee considered the propositions referred to them by the Conference regarding the enlargement of the Agricultural Department and were of opinion that the expansion could only be gradual owing to the paucity of trained men.

III. AGRICULTURAL ECONOMICS.

1. *Economic enquiry.*—Statistics bearing on the economic condition of villages were collected by the Committee's non-official co-operators, and tabulated in the office. A necessary defect has been the lack of uniformity due to differences in standards of valuation. There is a proposal to transfer this work to the Co-operative Department which is said to be engaged in a similar investigation.

2. *Agricultural co-operation.*—The Departments of Agriculture and Co-operation are devoting attention to this important subject and the request of the Registrar of Co-operative Societies that he should be given additional staff for pushing this work vigorously, has been sent up to Government with the Agricultural Committee's support.

3. The Committee have submitted their final recommendation on the establishment of a Land Mortgage Bank for the State, and expressed their conviction that the establishment of a Bank deriving the bulk of its capital from State-secured debentures, and devoting itself to long term credit on the security of land is absolutely essential to the development of agriculture.

IV. STANDARDS OF DEVELOPMENT.

The "Standard Development Forms" were revised and are pending the approval of the Committee.

V. COMMERCIAL CROPS.

Sugar-cane.—The District Committees have at the instance of the Agricultural Committee chosen typical sugar-cane tracts for study with a view to ascertain the facilities which have to be created to bring about a general expansion of cane cultivation. The Special Committee for the establishment of a Sugar Factory are collecting data and conducting preliminary investigations as to the most suitable sugar-cane areas for the purpose. The question of the supply of mills and jaggery boiling sets to meet District requirements is under the Agricultural Committee's urgent consideration.

Pepper.—Investigations are in progress as to the scope for developing pepper cultivation and the facilities necessary to induce people to take it up on a commercial scale.

VI. LIVE-STOCK.

The concessions already sanctioned by Government to stimulate the establishment of breeding farms for cattle and ponies are in operation and their effect has to be studied for sometime before fresh action can be proposed.

Government Sheep Farm, Gottigere.—The experiments with the Merino strain are in progress and promise well. The Dumbas have proved disappointingly susceptible to changes of climate and environment. Further experiments are, however, being conducted. The selective improvement of local sheep will receive attention this year. The Committee have a stock of 107 animals in the Farm at Gottigere.

VII. FRUIT CULTURE.

Work has suffered for want of rain but no opportunity for development has been omitted. Experience has emphasised the necessity for forming nurseries to meet local demand before any really striking results can be achieved and a comprehensive scheme of Horticultural work is before the Committee.

VIII. SERICULTURE.

The Committee are in close co-operation with the Department of Sericulture which has been devoting full attention to all branches of work connected with the silk industry.

IX. AGRICULTURAL EDUCATION.

The Horticultural School in the Lal Bagh has been working well. A special course for training Malis has recently been organized. It is ascertained that there is a great and growing demand for the services of trained men throughout the State.

X. STATISTICS OF AGRICULTURAL PRODUCTION.

Figures for almost all the Taluks for the year 1917-18 have been got and are under compilation.

XI. COLLECTION AND SPREADING OF INFORMATION.

The following bulletins and leaflets have been issued during the period:—

1. Consolidation of scattered holdings. (*English*).
2. Silting up of tanks and remedial measures thereto. (*English*).
3. Fruit Culture. (*English and Kannada*).
4. Points to be attended to in jaggery making. (*Hindustani*)

N. RAMA RAO,
Secretary.

EDUCATION COMMITTEE.

The following is a brief Report of work done by the Education Committee in the month of January, 1919:—

Home Industries.—The Instructor of the Tailoring Classes in the Home Industries Institute joined duty on 1st October, 1918. But regular classes could not be held at once on account of influenza in the city. There are now 12 on the rolls. The continuance of the Instructor's services has been sanctioned till the end of February, 1919. Fair progress has been made.

Recommendations were made to Government—

- (a) For transferring all the Home Industries classes and of the Home Industries Institutes at Bangalore and Mysore to the Educational Department
- (b) For deputing B. Nanjamma to the Phillipines to study the methods of developing and organizing Home Industries there.

Applications were invited from qualified persons by notification in the *Gazette*, for the place of the Superintendent of the Home Industries Institute, Bangalore, temporary arrangements being made for the work of the Superintendent.

Physical Culture.—The Physical culture class sanctioned by Government was opened on the 2nd instant. There are at present over 100 pupils. The Inspector-General of Police has sent 22 pupils from the Police Training School and the Inspector-General of Education 10 pupils from the Normal School, for training. About 90 pupils from other schools were selected. The class was being held in the premises of Police Training School at first. For want of sufficient accommodation, it has now been shifted to a rented building near the Fort.

City Economic Lectures.—Mr. H. K. Mallappa, the Economic Lecturer for Bangalore City, reverted to his appointment from his work in connection with war recruitment. He has since then delivered three lectures on 'Duties of Women' and the 'Depressed Classes' Employees and their Union and 'Duties of Men'. The Committee have recommended his appointment as Lecturer for both the Cities of Bangalore and Mysore.

Libraries.—The appointment of a graduate Librarian for the Mysore Public Library and a graduate Librarian for the Bangalore Public Library as well as the continuance of the Ladies' and Juvenile section of the Mysore Library for a further period of two years were recommended to Government.

The appointment of Mr. N. S. Subba Rao as Chairman of the Committee for the Mysore Public Library and the appointment of Mr. B. M. Srikanta Iyya as the Officer in charge of the Library were also recommended to Government consequent on the resignation of Mr. Humza Hussain of the Chairmanship. This recommendation has since been sanctioned by Government.

V. SUBRAHMANYA IYER,
Secretary.

PROGRESS IN THE DISTRICTS.

Chitaldrug.

EDUCATION.

A Scholarship.—Mr. Subbiah Naidu of Ballala-samudram deposited Rs. 500 in the Hosadurga Taluk Treasury for awarding a scholarship, in memory of his deceased son, to the best boy in the Lower Secondary class every year out of the interest realised on the amount. The District Committee resolved to grant the request of the applicant.

A Grant-in-aid School.—A sum of Rs. 120 was contributed by the people of Kondajji for starting a Grant-in-aid School in their Village.

Reading Rooms.—Five reading rooms were started in the Holalkere Taluk.

District Library Building.—A contribution of Rs. 5,000, was secured from the District Board for the construction of the District Library Building.

AGRICULTURE.

Improved Implements.—Twenty-three plough shares were introduced into the District and orders were canvassed for four more.

Distribution of Oil-cake, etc.—One hundred and sixty maunds of oil-cake were distributed, and thirty-two pallas of seed Bilijola were supplied to the Shimoga and Kolar districts.

Training in Mali Class.—Two candidates were sent to Bangalore for training in the Mali class started in the Lal-Bagh.

INDUSTRIES AND COMMERCE.

Slab-Industry.—The possibility of a slab-industry in Hiriur Taluk is being investigated.

Loan to a Furniture Factory.—A loan of Rs. 2,500, was sanctioned by the Director of Industries, on the recommendation of the District Committee, for the improvement of the Furniture Factory at Davangere, started by Messrs. S. K. Munderggi and Bros.

Shimoga.

EDUCATION.

Starting of Schools.—An English aided school was started at Nagar, and a day school for the benefit of Halepikas was started at Shindhuvadi.

School-Buildings.—Contribution of seven school buildings was completed during the quarter.

Reading Rooms.—Reading rooms were started at Triyambakapura, Somarsante and Hullatti.

Allowances to School Masters.—The members were of opinion that grant-in-aid school masters should be considered as whole time Government servants and that they should be entitled to both grain compensation and War allowance, and it was accordingly resolved that Government be moved through the Inspector-General of Education to sanction both the allowances to Grant-in-aid school masters.

Opening of New Schools.—The District Committee resolved to request the Inspector-General of Education to secure sanction for the allotment of sufficient funds required for opening 272 new schools during the year 1919.

GENERAL.

Village Improvement Works.—Village Improvement works estimated at Rs. 138-8-0 were executed in the Shikarpur Taluk.

CORRESPONDENCE.

To—The Editor,

Mysore Economic Journal, Bangalore.

Sir,—With reference to the note about "A Virus for the War on Rats" appearing on page 793 of the December issue of your very useful *Journal*, may I draw your attention to a even better method of getting rid of rats; I mean through "Ratol" made by the Tablet Mfg. Co., Cooper House, Ripon Road, Bombay. This, I learn, drives away vermin without killing them. I suppose this will be more suited to those who regard life sacred.

Madras,
27-1-19.

P. GANGA DHARAN.

QUERIES.

Hints to Correspondents.

Write on one side of the paper only. (2) Write each query on a separate sheet of paper. This will facilitate answering questions as in many cases they may have to be referred to experts. Put your name and address down on every such sheet. No attention will be paid to unsigned queries. (3) Drawings for illustrations should be on separate sheets of paper. They must be made in black ink only on white paper—not in pencil or colour—and twice the size they are intended to appear, especially reference letters and figures. (4) Put titles to queries, and, when answering queries, put the number as well as the titles of the queries to which the replies refer. (5) No charge is made for inserting letters, queries, or replies. (6) Letters or queries asking for addresses of manufacturers or correspondents, or where tools or other articles can be purchased, or replies giving such information, cannot be inserted except as advertisements. No question is answered through the post. (7) Letters sent by correspondents under cover to the Editor, are not forwarded and the names of correspondents are not given to inquirers. (8) As the space devoted to queries and replies is limited, they should be drawn up as briefly as possible. (9) To facilitate reference, correspondents, when referring to any letters previously inserted, should mention the number of the letter, as well as the page on which it appears. (10) All communications should be addressed to the Editor, *Mysore Economic Journal*, "Ringwood", Bangalore.

3. I require a market for tanned hides, tanned skins, sheep and goat, raw hides and raw skins in all sizes in the United States of America, Canada, in fact all America, England, Europe, Singapore, Penang, Japan, Burma and India. I shall thank you to let me have the addresses of wholesale direct purchasers, and purchasers on commission system, and buyers through agency system for the above.

Banganapalle,

10-2-19.

M. H. P. GHATALAH.

BOOKS IN BRIEF.

Hindu Charities in Bombay.—Compiled by F. K. Dadachanji. Published by the Social Service League Office, Sandhurst Road, Girgaum, Bombay.

This is the record of a survey undertaken by the volunteers of the Bombay Social Service League, with an illuminating preface by Mr. Dadachanji. The present writer knows how when he went round visiting the temples of Southern India—several thousands of them in the most inaccessible rural areas—he was mistaken for an officer of Government specially deputed to inquire into temple charities generally and how the most ignorant people clustered round him with long complaints against the systematic mal-administration of the charities which were nearest and dearest to their hearts. It was the general complaint that mismanagement was the rule and proper administration the exception. There can be little doubt that people everywhere would welcome a suitable Legislative measure to control the charities, some of them being several hundred years old in Southern India. The first step that should be taken in the matter is to enlighten Government of the strength of public feeling in regard to this subject. Second, we must by books of the kind that Mr. Dadachanji has brought out, drive home to the people themselves the immense amounts involved. Thirdly, we must get out, if possible, a comprehensive constructive programme (say, for instance, a Bill for each major Province or Native State) and put it up for adoption in each area. A Central Committee for all India including the Indian States to co-ordinate the work of the whole thus undertaken should also be evolved and it should be its special aim and object to initiate the general programme of work and get the committees in local areas to do their work efficiently and well. Mr. Dadachanji's suggestive preface and our own experience gained through our wanderings of over fifteen years in this part of India suggest that unless a comprehensive programme of work is adopted, the realization of the end in view will be deferred to the Greek Calends. The Social Service League and Mr. Dadachanji deserve to be congratulated on the selfless work they have done in regard to the matter. As a first preliminary it is very good but unless the Leagues in the South take up the work, a general campaign will well nigh be impossible. We commend the book to the attention of the Social Service Leagues and workers in Madras and Mysore.

India in the Middle Age.—By Stanley Lane-Pool, M.A., Litt. D. Published by K. and J. Cooper, Educational Publishers, Bombay.

To those who are acquainted with Dr. Lane-Pool's *Medieval India under Mohamedan Rule* and with his biographies of Babar and Aurangzeb in the Rulers of India Series, it is hardly necessary to commend this admirable little book. It is fully illustrated and written in a manner suited to the young student of Indian mediæval history. A book like this has long been a felt want and we congratulate Messrs. Cooper on its publication. Dr. Lane-Pool has, as might be expected, written within limits. This, however, does not mean that he has sacrificed matter for space, but only adjusted the matter to the requirements of the beginner. The book well merits the consideration of the Madras and Mysore Text-book Committees.

A Primer of Indian Administration.—By L. F. Rushbrook Williams, Fellow and Professor of Modern History in the University of Allahabad. Published by K. and J. Cooper, Bombay.

This is an excellent little book giving a summary outline of the growth and structure of Indian administration as it exists to-day. It is based mainly, though not entirely, on the *Imperial Gazetteer of India* (vol. iv.) and on the writings of other leading authorities like Ilbert, Lee-Warner, Strachey, Anderson, Baden Powell, &c. We have carefully gone through the book and can say it is a genuine attempt to give a succinct and correct idea of the Indian Constitution as it is to-day. The treatment of a subject like this requires both knowledge and skill, and both these Professor Williams has bestowed liberally in his book. For the beginner a better book cannot, we think, be recommended. Books of this kind deserve to be studied with Indian history in order that a knowledge of the growth of the Indian constitution might be easily grasped. Hitherto the absence of books of this kind stood in the way of giving effect to a general desire on the part of teachers to the early introduction of the study of the Indian Constitution, but with a publication like this of Professor Williams there will be little excuse for any further loss of time in regard to this matter. The Boards of Studies of the various universities would do well to remember books of this kind in recasting their courses of study in History and Indian Constitution in the years to come.

ACKNOWLEDGMENTS.

Mysore Agricultural Calendar 1919. Department of Agriculture, Mysore. Price one anna.
Ground Beetles attacking Crops in Mysore. By Leslie C. Coleman, M.A., Ph.D. and K. Kunhikannan, M.A., F.E.S. Department of Agriculture, Mysore. Printed at the Government Press, Bangalore. 1918.

Agricultural Calendar 1919-20. English Edition. Madras Agricultural Department. Price one anna.

RECENT PUBLICATIONS.

Some Aspects of Financial and Commercial After-War Conditions. Reflections of a student of finance on the prospective position. By Leonard Springer. 7½ × 5, 118 pp. P. S. King. 2s. 6d. n.

Cotton. By George Bigwood. (Staple Trades and Industries Series.) 8½ × 5½, viii. + 204 pp. Constable. 6s. 6d. n.

Indian Studies. By General Sir O'Moore Creagh, V. C. G. C. B. 8½ × 5½, 320 pp. Hutchinson. 16s. n.

From Mill Boy to Minister. An intimate account of the life of the Rt. Honourable J. R. Clynes, M. P. By Edward George. 7½ × 5, 119 pp. Fisher Untwin. 3s. 6d. n.

Technical Handbook of Oils, Fats, and Waxes. By Percival J. Fryer, Chief Chemist and Director of a drug manufacturing company. Lecturer in Oils, Fats, and Waxes, at the Polytechnic, Regent-Street, etc., and Frank E. Weston, head of the Chemistry Department, the Polytechnic. Volume II. Practical and Analytical. (Cambridge Technical Series.) 8½ × 5½, xvi. + 314 pp. Cambridge University Press.

The Production and Treatment of Vegetable Oils, including chapters on the refining of oils, the hydrogenation of oils, the generation of hydrogen, soap making, the recovery and refining of glycerine, and the splitting of oils. By T. W. Chalmers, on the editorial staff of the "Engineer," (The "Engineer" Series). 7½ × 7½, xi. + 152 pp. Constable. 21s. n.

The Physiology of Industrial Organization and the Re-employment of the Disabled. By Professor Jules Amar, Director of the Laboratory of Physiological Research in the Conservatoire des Arts et Metiers, Paris. Translated by Bernard Miall. Edited with Notes and an Introduction, by Professor A. F. Stanley Kent. 135 illustrations, 10 × 6½, 371 pp. The Library Press. 30s. n.

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RECENT PROGRESS IN AGRICULTURAL EDUCATION.

BY THE EDITOR.

SOME lines of progress in Agricultural Education are indicated in the laws and decrees issued in certain foreign countries. The full texts of these decrees and laws will be found by the interested reader in the *Annuaire International de Legislation Agricole* for 1917, copies of which have reached this country only recently. As these texts are in the French language and so not available to the general reader, it is proposed to give here a brief outline of the same indicating the nature of each decree or law in question with such other particulars as may be necessary to convey a correct idea of its exact scope.

To begin with, it may be stated that the laws relate to 1917, and relate primarily two European and two American States. The European States are Italy and Portugal and the American States are the United States and Uruguay.

To take the latter two first. A law of the United States of 23rd February 1917, as to technical Agricultural Education allots subsidies to the various States of the Federation, and in this way the Federation contributes to the cost of this type of Education. The separate States, however, should, in order to participate in these subsidies, constitute a Committee of three

members which will be charged to co-operate with the Federal Committee of Technical Education instituted by this law. This Federal Committee is to comprise of the Secretaries for Agriculture, Trade and Labour, the Federal Commissioner of Public Education, and three American Citizens nominated by the President, of whom one shall represent industrial and commercial interests, the second agricultural interests and the third the interests of labour. The Federal Committee with the Committees of the individual States must make special studies of agriculture, methods of cultivation, trade, etc., and thus enable these States to set up schools capable of giving really effective and practical technical instruction.

The other European State, Portugal, issued a decree on 6th November 1917, constituting a women's agricultural colony in the town of Alcobaca. Its object is to teach the pupils modern methods of agriculture and agricultural crafts, and to disseminate a suitable knowledge of agriculture in rural circles by means of lectures and practical training. Among the proposed Sections for study and training are the following :—

- (1) Fruit Culture.
- (2) Horticulture.
- (3) Gardening.
- (4) Agriculture.
- (5) Cattle Breeding.
- (6) Technology.

A personnel approximate to the above objects and aims is also sanctioned.

An analogous Italian law has reference to male adults. A decree dated 9th September 1917 (No. 1595) directs that the Provincial Agricultural Commission in every province must organize the technical instruction of the adult peasants by means of short practical courses bearing on crops grown locally, agricultural machinery, agricultural industries, courses of practising lessons in small forest and rural industries, courses of domestic economy, and practical courses in the improving of and settling on plantations. In order to ensure this instruction, the decree places the necessary funds at the disposal of the Ministry of Agriculture. The amount sanctioned may, in passing, be noted. For 1917-18, it was 300,000 liras, and for 1918-19, it was increased to 700,000 liras, which, if necessary, was to be extended for other necessary connected work to 1,000,000 liras. The annual programme of work is to be submitted to the Minister of Agriculture and should have his approbation. Another Italian decree (No. 1947) of 11th October 1917, regulates the granting of the title of *privat docent* in the higher schools of agriculture, and authorizes the official professors of these schools to hold private courses in all subjects which are taught in them and analogous subjects. This decree is an interesting one inasmuch as it sets out fully the conditions on which the degree of *private docent* can be granted. *En passant* it may be remarked that it may prove of value to those interested in the granting of agricultural degrees generally.

A short decree of Uruguay dated the 23rd October 1917, establishes a programme for the agricultural stations for the study of agricultural science. Another decree of the same State and of the same date provides for the reorganization of the work connected with the inspection of agricultural education, determining the qualifications of Inspectors.

Comment on the above laws and decrees is hardly needed. One or two points may, however, be noted. The provision for adult—

male and female—training is worthy of remark. It shows the importance attached to the matter of training adults, *i.e.*, the *present* generation, not merely depending on the *future*. A second point is the close attention paid in foreign countries to the study and improvement of *local* crops, and the devoting of increased expert knowledge to them. The United States law is particularly interesting from this point of view. So also is the first Italian decree mentioned above. A still another point is the association of Committees, consisting of experts and ordinary citizens, with Government Committee brought into existence, in the same American Statute. The provision in the courses of study prescribed in the Italian decree for practical courses in small forest and rural industries, is also worthy of note. The great stress laid on *practical* courses, *practical* lectures, and *practical* instruction ought not, again, to be missed by the thoughtful reader. If Agricultural Education is to bear fruit, too much emphasis cannot be laid on the great need there is for its being made thoroughly *practical* in character.

At its fifth meeting held on 15th March the Industries Branch of the U. P. Board of Industries disposed of a reference from Government regarding the draft rules framed under section 11 of the Indian non-ferrous Metal Industry Act 1918. An opinion on the recommendations of the Indian Industrial Commission was also submitted to Government. Rules in connection with the grant of scholarships for training in oil mills in India, were also drafted, for submission to, and approval, by Government.

SUGAR PRODUCTION IN INDIA.

BY H. HAMEL SMITH,

Editor of "Tropical Life," London.

HARPING back to my previous article (published in your issue of January, 1918) urging India to try and make a special effort, with the favourable prospects immediately ahead of us, to make herself self-supporting as regards her requirements of sugar, (and even to produce enough to enable her to export a substantial quantity as well), those who wish to see the industry expand would do well to watch Germany and her labour upheavals.

The International Confectioner of New York, included an article in their January number, contributed by their London correspondent which is worthy of note if only because the writer called attention to the output of sugar in India and elsewhere in the British Empire, as follows:—

"So far as my own buying is concerned," a big London confectionery manufacturer told the correspondent of the "I.C.," "I believe that it will be possible to do without German sugar and whatever the price may be at which they offer it to us, I, at least mean to do without it. Under proper cultivation in suitable centres cane sugar could be produced more cheaply than beet and delivered, in spite of the heavier cost of freight, even when compared with what the trans-continental railway charges on beet-sugar from Germany and Austria now that the war is over."

Later on we are told that, "of course costs at all centres will be higher but the ratio of increase is certain to be greater throughout Germany and Austria than will be the case throughout the tropics," and then against this, are reminded that, "India*

if properly equipped, could be made to produce on its present acreage, a surplus of sugar, more than enough, that is, to satisfy its present deficit of 800,000 tons and sufficient even to satisfy the needs of Great Britain. This could be done, were the brains and ability present (among the cultivators) in India that are to be found in Cuba and Java."

The last paragraph but one in this article is by no means the least important for it runs thus:—

"The whole question, as it stands to-day reminds one of the child's query—"Which came into the world first, a hen to lay an egg or the egg out of which the first hen was hatched?"—So I would ask, who must be the first to start, the planter to deserve a preferential tariff, or the public to offer one in the hopes that by so doing, they will induce planters to extend their areas and also to increase their yields by adopting more up-to-date methods out in the fields? The only answer I can suggest at the moment is that the British Government, and that means the British public, are more likely and will be more ready, to offer a preference to British Colonial grown sugar in the hopes of making the Empire independent of outside centres for its sugar supplies, than the producing centres throughout the Empire show signs of being able to earn it on such terms. Many centres are willing to do their best but without the help of India, the best that the rest of the Empire can do, will not render us independent of outside supplies for many generations to come—if ever."

I did not mean to quote quite so fully from the American paper, but there is much more that I should like to reproduce as well, to hope that the paper or the article may yet be read and circulated among sugar men in India. I wanted, however, to bring the foregoing before the attention of your readers, especially the question of increased costs in Germany and Austria, because of what I am now about to say. A table published

**The High Price of Sugar.*, Bales Ltd., London. 1s. 3d. post free.

in the issue of Messrs. Willett & Gray's (of New York) sugar circular of February 27th, points out that the increased costs in Germany last year (1918) already showed an increase of 350 per cent over the figures of 1914, and that this year's, 1919, will be higher apparently, and over four times the pre-war cost. This is what Messrs. Willett & Gray tell us when speaking of the sugar position in Germany at the end of February:—"The Association for the Development of sugar consumption has addressed a communication to the Department of the Interior, in which is pointed out the extreme necessity of immediately increasing the price of beet roots, as otherwise the industry will be exterminated. The communication has been approved by the German Sugar Association. The following are the important clauses contained in the letter:—

1. If it is not possible to put into the fields, in the spring of 1919, women labourers in quantity, the cultivation of beets for sugar-making, will show a heavy decrease.

2. If sufficient sugar is to be produced, it is necessary that the price of the beets be increased to Mks. 5 per centner (Fcs. 125 per ton) in 1919, and that the price be published at once.

The following table shows the increase in the cost of production between the year 1914, and last year, calculated in francs per hectare:—

	1918	1914
Salaries	345	105
Labour and transport (of beets)	1,015	260
Coal, freight, &c. ...	985	285
Chemical tests, &c. ...	360	140
Taxes, rent, &c. ...	115	35
Per Hectare Fcs.	2,820	825

This is what last year's crop cost, when the military cheque still had Germany in its grip and when everyone had to do what as he or she was told to help to win the war for Germany and so try to save the skins of

the Kaiser and the Crown Prince, no matter how much everyone else suffered. Then again, as we are reminded, this year's crop again depends on whether there will be adequate supplies of women willing to work in the beet fields; from all one hears, those anticipating such a labour supply may not receive all they hoped for and thus costs would again go higher whilst transport costs on all sides during 1919, are likely to be far ahead of 1918, when the military had control and had all the rolling-stock, engines etc., that they had stolen from France, and elsewhere and the facilities and ability to move goods far less.

Even were 1919 to show no higher costs than 1918 as regards the German output of sugar, it will still be nearly 350 per cent more per hectare than in 1914, whilst the yield per hectare is much less, (20.024 kilos as compared with 34.036 kilos in 1914). Before the war also a ton of beets was worth Fcs. 30 a ton only, now we are told, at least Fcs. 123 tons must be paid, or over 400 per cent rise. "Some rise" as the Americans would say. All this bears out what the writer claimed in *The International Confectioner* and should be good news for India and all centres striving to turn out British canesugar at a price to compete with German beet. With a rise like this in Germany, although our costs have also risen, we ought to be able to turn out cane sugar and even deliver it to the factories in the U. K. at prices considerably below Germany or elsewhere on the Continent. There is no doubt that we could, and since this is so, if we do not start right now to produce that sugar with all these points in our favour, we never shall.

To give some idea of what large increased amounts will have to be paid out in Europe if the beets are to be grown for supplying the sugar factories not only in Germany and Austria, but also in Russia and elsewhere—for all countries will have to pay much higher rates—I will include the following

table contributed by Dr. Pruisen Geerligs to *The Louisiana Planter* :—

Production of beet sugar in Europe.

Tons of 1,000 kos.	1913—14	1914—15	1918—19 Crop.
Germany ...	2,718,000	2,564,000	1,400,000
Austria-Hungary.	1,688,300	1,619,000	900,000
France ...	781,000	295,000	100,000
Russia ...	1,688,000	1,939,000	700,000
Elsewhere ...	1,286,100	1,239,000	705,000
Totals ...	7,161,400	7,676,000	3,805,000

Messrs. Willett & Gray, gave the World's crops of sugar cane and beet, as follows in their issue of February 27. This includes British India at 2,950,000 tons for 1918-19 3,229,000 in 1917-18 and 2,728,000 tons in 1916-17.

Sugar Crops of the World.

	1918-19	1917-18	1916-17
<i>Cane.</i>	Tons	Tons	Tons
America N & S.	6,293,660	5,717,012	5,460,997
Asia ...	5,180,000	5,633,942	4,962,855
Australia and Polynesia ...	306,000	425,900	292,831
Africa ...	564,000	544,916	522,513
Europe—Spain...	6,000	6,000	4,584
Total of cane ...	12,349,660	12,327,770	11,243,780
<i>Beet.</i>			
Europe ...	3,692,900	4,172,672	4,856,337
U. S. A. ...	665,000	682,867	734,577
Canada ...	22,300	11,250	12,500
Grand Totals...	16,729,860	17,194,559	16,847,194

With regards to cost of canesugar manufacture on the estates, I see by the fourteenth annual report of the Directors of the Antigua Sugar Factory Ltd., of the West Indies, the total tonnage handled was 64,282 against 102,601 tons during the previous season. No wonder, therefore, that the directors complained that in spite of their appeals for larger and more regular supplies even during the 102,600 ton season, that their last crop left them with 627 hours idle for want of cane. Such a spell is bound to affect costs. As things were, the original contractors who sent in 16,267 tons of cane are down as having received 1-19-0³/₄d. per ton of their cane, whilst new contractors, who sent in 46,116 tons, received £1-9-4 per ton including the bonus. A further 1,897 tons supplied by peasant proprietors was paid for at the rate of 0-18-10³/₄ per ton.

Now coming to the factory charges for making up this raw material, i.e., the cane into sugar, these are returned as having been £5-11-1¹/₂d. per ton of sugar made, including salaries, wages, repairs, duties, and local taxes. This shows a large increase on the charges for the previous crop although railway transport was less by 4s. 3³/₄d. per ton. Altogether the increased cost seems to have worked out at 15s. 2¹/₄d. per ton (see *Agricultural News* of Barbados for February 8 and 36.)

Other particulars given show that 7,316 tons of sugar were made (out of 64,282 tons cane) as compared with 11,705 tons of sugar, ex 102,601 tons of canes in 1917 and the total proceeds from the sale of the sugar and molasses came to £176,835, as compared with £252,617 in 1917. As the expenditure amounted to £124,338, a balance of £51,297 was left for dividing, and of this sum, £19,219 went as bonuses to the new contractors, whilst of the remaining £327,78, half was paid out as bonuses to the original contractors (hence the higher remuneration for their canes) and

half placed to the credit of the shareholders, and as liable to Excess Profits Duty. Under the latter heading £16,578 went into the coffers of the Imperial Exchequer in 1917, whilst £3,060 was paid locally for export duties.

Taking another central factory, that at St. Kitts (or St. Christopher to give its full name). Here the crop was also small, 40 to 50 per cent below the figures for 1917, and with the cane gathered the dry weather increased the fibre content from 14.15 per cent in 1917, to 16.02 per cent last year. Here again small supplies sent up costs; on the other hand, the sugar last year seems to have realised higher rates than in 1917.

The total amount of cane dealt with in this factory (in St. Kitts) was 62,354 tons during last year. Of this quantity, 55,820 tons were supplied by the original contractors who received, including bonuses, £1-5-10½ per ton whilst outside suppliers sent in 6,533 tons, and obtained £1-5-6 per ton. The factory charges were £4-19-2¼ per ton of sugar made; the railway transport £1-12-7¾ per ton, and the administrative charges of the London office 3s. 8½d. per ton. There were 7,314 tons of sugar produced, and the net proceeds from the sale of sugar and molasses amounted to £171,616, which, after deducting the expenditure, left £32,752 for division between the cane suppliers and the shareholders. The latter's share again being subject to excess profit duty which in 1917 (not last year) amounted to £24,554 whilst the export taxes came to £4,085.

The St. Kitts analyses showed a sucrose content in the cane of 13.02 per cent, sucrose left in megass 2.55 per cent, recovery of sucrose in the cane 86.55 per cent.

WANTED—A NEW OPENING FOR AGRICULTURAL GRADUATES.

By K. KUNHIKANNAN, M.A.

IT would not be an exaggeration to say that the Agricultural Colleges in India are yet far from justifying the primary object of their existence. In so far as they have trained men for service in the Departments they have served a useful purpose. But the main hope of the pioneers of Agricultural Education that a band of trained men would go back to land to settle amidst the rural population and help in the diffusion of scientific methods, is yet very far from realisation. The bulk of Agricultural graduates seek for appointments before the ink on their certificates is dry and the increasing requirements of a rapidly developing department are such that a fair number are annually absorbed. For those who do not gain admission a generous government have declared that for purposes of entry into other branches of Government service a course in agriculture is as good as any other course.

With these facilities and concessions the Agricultural college has simply become another avenue for government employment. The applicants for admission are mostly students who, having proved unequal to the strains of literary education, try to make up for lost time by entering the one College which gives them the last chance of obtaining government employment. The attraction has, therefore, been not to quite the right sort of men. As soon as the course is over they seek the most varied employments, and among them may be counted clerks, accountants, Plague Inspectors, Revenue Inspectors and Surveyors.

The result might have been foreseen. The colleges were instituted at a time when both success at the examinations and admissions into Government service had become

extremely difficult and there were growing a class of half-educated unemployed to whom the new institution came as deliverance; and the concession that the Agricultural graduates could be admitted to other ranks of government service, intended as it was to attract students to the college was extremely ill-judged for it helped to divert even the residue left after meeting the requirements of the Agricultural departments, from returning to the land. In fact, the history of Indian education is being reproduced on a smaller scale in this its latest branch. It was the aim in the early years of British Rule that Indian Education would make for their rapid diffusion of western culture and for the elevation of character, instead of which we had the experience of the system becoming little more than a huge machinery for the manufacture of clerks and minor executive officers of whom large numbers were required year after year. So with Agricultural education. Started with the idea of bringing into existence a class of scientific farmers the agricultural colleges have become instead training grounds for recruits to the Agricultural Department.

That the Colleges ensure a supply of men adequate to the needs of Agricultural Department is certainly a point in their favour. But even this has to be accepted with large reservations. For the standard fixed for admission to the college is not regulated by the requirements of efficiency and intelligence which is necessary in a Government Officer but by the minimum required to make one a scientific farmer is by no means all the equipment required to make one a successful agricultural officer. There can be no doubt so serious an anomaly will make for inefficiency among the Departmental Officers.

These are unpleasant facts which should no longer be suppressed. There is little use in trotting out the commonplace that Indians prefer the security of a government appointment in the freedom of an indepen-

dent living; nor is it easy to believe that the agricultural graduates have little confidence in the methods in which they have been trained. It would indeed be time for closing up the department if the men trained in the Agricultural College believed that they cannot by adopting the improved methods either on their own lands or on those of others, earn the mere pittance with which they are usually started in the Department.

The results have fallen so far short of expectations because the agricultural graduates find no openings outside the Departments, where they can turn their newly acquired knowledge to good account. Whatever their own ideas their parents or guardians are not advanced sufficiently in scientific methods to believe in scientific farming and they are seldom prepared to hand over to them the management of their lands. The young man has only a share in the family property which will not be made over to him for management and which on partition would leave him too small a fragment for economical working. A third and more serious obstacle is the want of capital. Or again there may be a long lease running which it is not easy to cancel. In the case of a young man who had none of these obstacles but nevertheless entered the Department enquiry elicited the interesting explanation that he could direct scientific farming in his estates by occasional visits and by correspondence and any deficiency in this method was more than made up by the pay he received.

Most of these difficulties arise from the fact that in the peculiar conditions of India there is very little chance of capitalist-farming on any large scale or of its advantages being perceived by the people. The large land-owners are either men who are engaged in non-agricultural pursuits and have neither the inclination nor the leisure to give more scientific direction to the cultivation of their lands or if they belong to the rural classes are precisely at the level of the

ryots in regard to their attitude to scientific agriculture. To the small class whose attitude has been changed for the better by education, the scattered nature of their lands is an insuperable obstacle to the employment of improved methods which are seldom successful unless the property is in one continuous block.

These are some of the difficulties in the way of the agricultural graduates going back to the land and they will long remain as serious obstacles. It is difficult to estimate the loss from absorption into Government service of men who could as scientific farmers have served admirably as an agency for the dissemination of useful knowledge in Agriculture among the rural population and who could from their freedom from official taint command to a greater degree the confidence of the ryot than Government servants can ever hope to produce. If they are attracted back to their calling, the scientific methods which they will adopt will soon spread among the ryots who are always ready to adopt methods practices once their superior merit has been demonstrated. They will help to further test and verify under the varying conditions of their localities the results which the Department obtains by the experiments usually conducted in one. They will be able to interpret the needs and requirements of the ryot to the Department and the ideals and objects of the Department to the ryot.

These are some of the more important advantages to be derived from attracting trained men to the land which more than justify the exertions of Government in that direction. Indeed the Agricultural College by itself without a scheme for retaining on land the men trained in Agriculture will remain a half measure that will continue to defeat the very object of its existence as it has done in the past. It seems, therefore, necessary to create a counter attraction to the department by bringing into existence a number of large estates all over the country owned by Government but

offered to Agricultural graduates under more or less the same conditions as are imposed in the hire purchase system. Implements and manures should be given by Government. Periodical advances for wages but including also an allowance for personal expenses of the farmer should also be made. The cost of these with interest at 6 per cent should be recovered in instalments which shall be distributed over a number of years according to the kind of land. Until the money is fully paid back the farm will remain the property of the government. The amount to be paid each year shall be fixed by the government. The lessee shall bind himself to work the estate for at least a period of ten years. Failure to pay the instalment or mismanagement will be followed by forfeiture.

Once the claims of the government have been discharged, the estate should become the property of the farmer. The supervision and control hitherto exercised will be withdrawn. But one restriction will remain for which perhaps special legislation may be necessary. The estate should be exempt from the operation of the ordinary Hindu laws of inheritance. Without this safeguard the property is liable to disintegration in the course of a generation or two and there will result the same fragmentation of land into small attenuated holdings which is one of the chief obstacles to scientific agriculture in India. The property should, therefore, descend by inheritance to only one among several heirs who should be allowed to purchase the rights of others.

The value of the estates so managed and so safeguarded from disintegration can scarcely be exaggerated. They will demonstrate to the large class of absentee landlords the value of scientific direction and control. Scattered over the country they will be the centres from which will spread to the surrounding areas the methods of improved scientific agriculture. To the Agricultural department they will be a valuable auxiliary to the demonstration carried out by its officers and as helping the rapid accumulation of a mass of accurate agricultural data which will minimise the risks that attend what is the occupation of so large a proportion of the Indian population. In the services thus rendered to the Department and to the ryots, the State will more than repaid for the money expended.

CO-OPERATION IN BENGAL, 1917-18.

By "RUSTICUS."

AS time goes on, cracks are beginning to appear here and there in the imposing co-operative edifice which has been built up in India. There is still no doubt about the stability of the building but if the cracks are allowed to go on widening, its safety will be endangered before long. Fortunately, the architects are fully alive to this and the requisite repairs are being undertaken. In the latest Report on the working of Co-operative Societies in Bengal and the review thereon, neither the Registrar nor the Local Government shows any desire to gloss over unpleasant features. Mr. Donovan frankly admits that the fact that overdue loans outstanding with members of Agricultural Societies, which in 1916-17 exceeded 17 lakhs out of a total of 55 lakhs, increased in 1917-18 to 28 lakhs out of a total of 64 lakhs is one the seriousness of which cannot be minimized. He explains it by the low prices of all agricultural produce, except sugar-cane, which prevailed in Bengal throughout 1917-18. The cultivators had not the money to pay their primary societies and this, in its turn, reduced the resources of the central banks which were not only unable to recover their loans to societies but also to secure fresh deposits, as the prosperity of the class of depositors which favours them is dependent on that of the cultivator. Again, new supervisional unions could not be formed as the societies were under the impression that, by combining into unions, they would undertake additional liabilities at a time when they had difficulties in meeting those actually existing. The outlook this year, owing mainly to the rise in the price of jute, is distinctly brighter and Mr. Donovan reports that collections are progressing most satisfactorily, especially in the jute districts, in some cases being ten

times as great as they were on the corresponding date last year. But it is obvious that far too many members of co-operative societies have yet to learn that the true aim of co-operation is the promotion of thrift and not of indebtedness. More propaganda work is essential if this lesson is to be driven home and such work cannot be carried on properly except by an increased staff. An increase in staff is also essential in order to ensure the removal of another ugly feature of the movement in Bengal, the misappropriation of cash balances by secretaries and treasurers, and the appropriation of large loans by office-bearers which occur much more frequently than they should. Mr. Donovan has no reason to complain of the way in which he has been treated by the Local Government in the matter of staff. During the year under review, three Deputy Registrars with the powers of a Registrar were appointed, the number of Government Inspectors was increased from 22 to 42 and a Chief Auditor and 14 Auditors were added to the strength of the Department. Half the cost of the Chief Auditor's appointment is borne by Government, the whole cost of the Auditors, whose pay is Rs. 75 a month being met from audit fees levied on societies. The effect of this increase in staff should not be long in making itself felt. It is, however, necessary to utter a word of warning in this connection. We learn that a proposal to allot a sum of Rs. 50,000 to the Co-operative Department for a Joint Registrar and Inspectors for industrial societies was carried by a large majority in the Bengal Legislative Council. The mere formation of societies from above is not sufficient. There must be a spread of the true co-operative spirit. One would have thought that the dangers of forcing the pace too rapidly were already sufficiently apparent both in Bengal and elsewhere.

Judged by figures alone, the progress in Bengal 1917-18 was not unsatisfactory. The number of societies increased from 3,086

to 3,643, the number of members from 1,43,448 to 1,62,986 and the working capital from just over Rs. 1½ crores to very nearly Rs. 2 crores. The Province has at last got a Provincial Bank which commenced operations on April 1st, 1918, and by June 30th had 31 societies as members and a paid up share capital of Rs. 82,625.

We have already commented on the outstanding features of the working of the ordinary societies by which we mean societies for the provision of credit to agriculturists. As for non-agricultural societies, the Bengal Co-operative Department is devoting special attention to Weavers' Societies. A brief description of the organization of these societies may be of interest to co-operators generally for, as Mr. Donovan says, there is a widespread impression that there is a great future for the handloom industry, if it is organized on co-operative lines. The impression has, at present, very little foundation in fact. The list of obstacles given by Mr. Donovan is a very lengthy one. The intrinsic difficulties which have been encountered are the unreliability of the weavers, which makes it impossible to enter into regular contracts with them, their conservative instincts, which make them regard with suspicion any attempt to improve their lot, their credulity, which makes them believe the wildest rumours, and their superstitions, which involve a great waste of their time. The difficulties from outside have been the high and fluctuating price of yarn, the desire of the money lender to exploit his weaver clients to his own advantage at a time of shortage of cloth and the ready sale the weaver has found for his cloth which has often been bought off the loom. The high price of cloth has given the weaver a temporary prosperity which has made him opposed to joining a society which enforces discipline and does not promise immediate profits far beyond what he can get by his own disorganized methods. Nevertheless, the number of weavers'

societies in Bengal increased in 1917-18 from 34 to 65. The model adopted has been an Irish one, that of the Aran Fishermen's Co-operative Society. Each member is expected to pay eight annas towards shares in the society and to contribute from his earnings one anna in the rupee towards further share capital. A society of twenty weavers would thus begin with Rs. 10 capital and the weavers could earn at least Rs. 20 per month each, which would enable them to contribute Rs. 1-4-0 each or Rs. 25 in all towards capital in one month. After a year, their capital would amount to Rs. 300, which Mr. Donovan considers quite enough to keep them out of the hands of middle-men. Experience of so-called weaving societies at Serampore and Faridpur has compelled the Co-operative Department to decide that no money should be lent to any weavers. Only yarn, other materials and looms are advanced and the materials have to be accounted for in cloth, the loom remaining the property of the society until the weaver has paid for it. As each society cannot arrange to get its yarn wholesale, the societies have been grouped together into a union in which each society purchases shares with its own share capital. The union gets yarn wholesale and arranges to dispose of cloth which its affiliated societies are not able to sell. A passed student of the Serampore Weaving Institute has been placed with each little group of societies to instruct and supervise them.

The scheme is an excellent one but Mr. Donovan emphasizes that nothing yet accomplished can be claimed as a success and that the outlook is very uncertain owing to the characteristics of the weavers and the likelihood of renewed competition from the mills when peace conditions are fully resorted. None the less, the Bengal Co-operative Department is to be congratulated on a bold and interesting experiment.

Another development which deserves mention is the increase in the number of

milk societies in Baraset. There are now six of these. They send their milk in locked cans to Calcutta. It is tested before despatch and on arrival and the consumers, therefore, are certain of receiving as it comes from the cow. The great obstacle to progress is the high cost of management which is due to the fact that the societies, though close together, will not combine. Each of them sends a man with its milk to Calcutta so that six men travel daily, where one would be enough. At present, only nine maunds of milk is supplied every day to Calcutta, a mere drop in the ocean of milk required. It is hoped, however, that more societies will be organized and that eventually the milk will be taken to Calcutta by motor. There are great possibilities about this scheme and extensive developments would be very welcome for the supply of pure milk to large cities in India is one of the most important problems which awaits solution by the Agricultural and Co-operative Departments.

We should have been glad to have had more details of the working of the Naogaon Ganja Cultivators' Society which was started in July 1917, in order to eliminate the middleman. The Local Government has granted it a monopoly of trading in ganja and bhang though whether over the whole province or only in its own vicinity is not stated. The monopoly appears a profitable one for the society ended the year with a balance to its credit of over Rs. 5 lakhs, which works out at rather less than Rs. 200 per member. The assistance given by Government prevents the society from being regarded as an object lesson in what can be achieved by co-operative sale of produce. That is a branch of co-operation which is not making any more rapid head-way in Bengal than in other parts of India. 'Co-operation in Agriculture' in Bengal mainly takes the form of distribution of good seed both of ordinary and improved varieties of such crops as rice, and sugar-cane (jute is not mentioned) and the popularization of improved methods of cultivation.

MINOR TANKS IN THE MYSORE STATE AND THEIR BEARING ON THE WATER-SUPPLY.

By E. W. RUTHERFORD,
Oosoor Estate, Hassan.

OWING to the last seasons drought, and the consequent dearth of water, practically the whole of the Minor Tanks both in the Maidan and Malnads have, by the deeping of the outlet, been drained of their last drop of water. Now though everyone with crops, etc., needing water, was energetic enough to deepen the outlet, so as to get the run of the last drop of water from a tank, still it seems to be nobodies job to fill in these drains, even though it means only the replacement of the earth removed, and in the majority of instances would only require an hour's work by one man. With the near approach of the first rains of the season, these outlets, should be prepared against their fall, as these minor tanks are the mainstay of the moisture of the country, and on them depends the springs opening freely. One would like to see an order issued to every Village Official, to the effect, that all outlets should be filled in with first rains. It may seem a small point, but these outlets are the safety-valves of the tanks, and many days water may be easily lost by the apathy of those concerned, and in a year like this, when one does not know what one has got before one in the way of climate, these days of water lost may be a serious affair, and this is really a matter for the people and one that they should not wait for Government to insist on.

It is lamentable how careless the average villager is with his water, till it begins to run short, when he will, when too late try to economize. One often saw even in a year like last, outlets of minor tanks so deepened, that it was only a question of time for the

supply to fail, as once the drain was lowered it never seems to be anyones business to—when crop had received sufficient water—shut off the supply, and not let it run to waste. The majority of the silting up of tanks is due to the above procedure, as the water is quickly drawn off, so is the surrounding soil drawn in.

Government through numerous agencies have been now for years trying to get villagers to take more interest in their water-supply, but though here and there individual tanks may be attended to, the fact that these tanks are interconnected with each other is overlooked. If one examines a series one comes to the conclusion that the first civilized inhabitants, starting from the higher grounds, constructed at every favourable point, embankments in such a manner as to form series or chain of tanks, the out-flow from one at a higher level supplying the next lower, and so on all down the course of the stream at a few miles apart. This linking together forming such a continual chain of works that not a single drop of water falling on the catchment is lost in seasons of drought, and but little in ordinary seasons. One hears it said that the water in the rivers is not what it used to be during the hot weather, and some lay the blame to the cutting away of the jungle in the catchment area; but may it not be that the neglect of the principle that each one of these tanks is dependent on another, has led to several of a series being allowed to silt up, with the result that the water of those of the higher level instead of finding a gradual approach to the river, rushes right through, with the consequence that the majority of it is lost, instead of being retained in a gradual flow, which being absorbed in its course, helps to keep the springs always open.

There seems to be some justification for saying that a great increase in the water conserved through the State, might be obtained by the simple means of regarding each tank, from that at the head of a valley right

down to that one where outlet is close to the river, as all dependent on one another, and so when any one of a chain is put in order, the one on the higher level, above its inlet, should also be attended to at the same time. It might not be possible all at once to put in order a whole series, but nevertheless means should be taken to embank up the water at all places where tanks existed, even if they are not cleared of their silt, as by this means one will get a gradual flow, and a sub-soil soakage at all times, in the place of a rush of water running to waste. For instance, "A.B.C.D." is a series of tanks. The villagers of "A and D" have their tanks in repair, but B and C are old or neglected tanks. Now if in times of drought, or through apathy, "A" lets out most of its water, this will flow straight to "D" instead of being "held up" at "B and C" with the result that if, "D" also acts as "A" did, the chances are that the whole area of this series will lack water to a much greater extent than would have been the case if "B and C" had acted as stops, and so conduced to a gradual flow of water through the area.

One has almost a complete analogy to this tank system, by comparing it to the old canal system in England, where the water was held up by a series of locks. The traffic on these canals was not able to compete with that of the Railways, or as in some instances the Companies got into the control of the Railways; the result being that the locks were allowed to get out of repair, and thus one has now, nothing but a dry trench, (in which there is some talk of forming roads for fast traffic) in the place of what used to be an even flow of water running through an area of country. If one substitutes the words "Minor Tanks" for "Locks" one has then the whole principle of the influence these tanks have in holding up, and regulating the flow of the water through the Mysore State, and the first cultivators must have realized, from experience, that this was the only way to insure a steady flow of water

always being available for their crops. One may take it that they would not have gone to the enormous trouble of forming series of chains of these tanks all through the country, from the head of each valley right down to the rivers, if they had found that one here and there would have answered the same purpose; they must have realized that to be of any real economic use, the flow of water must be made as slow as possible through the area, and that their reservoirs must catch as much water as possible, and each must feed the one below it. One can quite imagine that the first cultivators as a matter of course dealt with the repair and upkeep of their tanks as part of the years cultivation, and not as a lot of the present day ryots are rather given to regard them, *i.e.*, as being something to be avoided if possible.

In conclusion one cannot help adding that when one takes into consideration the heavy rainfall that falls in the different areas of the State it strikes one very forcibly that the whole of this must have been to a great extent held years back when all tanks were in order in the areas in which it fell, by means of these chains of tanks, and from them it was gradually percolated through the country. In fact one has one of the finest irrigation systems in any country, if the principle on which it was founded is always kept in mind, as it is on this that the whole depends, and the breaks as now of several links of the chain weakens the whole if it does not ruin it.

ORGANIZATION OF SERICULTURE IN MYSORE.

BY N. RAMA RAO, B.A. B.L.,

*Superintendent of Sericulture, Mysore
State.*

THE fact that silk has ceased to be solely an article of luxury, and that the world's demand for it is growing much faster than the supply ought to be of special interest to Mysore which is the largest silk producing country in India. It has been repeatedly pointed out that sericulture has an important place in the agricultural economy of the State, furnishing as it does a solution to some of our more urgent problems of rural unemployment, and that its development is no less essential from a humanitarian than an industrial point of view. Before the Mysore silk industry can find in the widening of the world-market scope for strength and growth, it should rid its system of deep seated defects, and lift itself out of the narrow groove which holds and confines it. I refer to the defects of organization, which may be classified as internal and external. Under the first class, I would group all defects which directly render production less efficient by raising its cost, or lowering its quality. They affect the work of the grower of mulberry, the rearer of cocoons, the reeler of raw silk. They place obstacles in the way of the best combination of the factors of production, entailing waste on the one hand, and injuring quality on the other. The second class of defects—which I have called external—are defects of trade organization, and weaken our position in regard to the market. They include vicious system of finance, ignorance of markets, and the tendency to cling to traditional methods of business which foster a host of parasitic middlemen who not only sap the life of the industry, but break the wholesome touch

between producer and consumer so essential to the efficiency of the one and the satisfaction of the other. Mysore has every natural advantage for the production of silk, and yet we have secured no new markets, and even in our old ones, we are feeling the pressure of foreign competition. In South India, we barely hold our own, while China and Japan have not only secured a footing but have been steadily gaining ground; in Bombay, large vested interests are against us, and over much of India Mysore silk is a thing unknown. In Europe we have effected no lodgement, though our silk was pronounced as good as the Japanese, when the factories got a chance of comparing the two. This must give us furiously to think.

Mr. E. C. Ansorge * who investigated the nature of the South Indian demand for raw silk in an attempt to discover the cause of the growing popularity of the foreign article, found that Mysore silk still retained its hold on most of the weaving centres, but that it suffered from two grave drawbacks, expensiveness and bad reeling. It might appear paradoxical—but is nevertheless true—that our silk is expensive, because it is badly reeled.

The cost of the silk to the purchaser does not by any means represent the receipts of the producer. The producer must, of course, be getting enough to make it worth his while to produce at all, but the main part of the profit goes to the middleman. The most obvious way, then, of reducing the cost to the consumer is to cut down the number of men through whose hands the article has to pass before it reaches him. The best trade organization is the simplest and most direct route between producer and consumer, and we shall discuss this point later on. There is still another way of lowering the cost and that is by improving

the methods of production so as to turn out at least as good an article at less expense. In this paper I propose to examine the conditions of production to ascertain whether by better organization, Mysore silk could not be produced at lower cost. I hope to be able in a future article to discuss the problems connected with reeling and trade organization.

The first essential of the silk industry is mulberry cultivation. The grower raises the crop either for his own use, or in the expectation of finding a purchaser if sentiment or custom forbids his rearing silk-worms himself. In the latter case, there is an element of risk due to error in forecasting the strength of the demand. The separation of mulberry cultivation from silk-worm rearing makes the former less profitable, and more liable to suffer from the competition of other crops; and this necessarily impedes the expansion of the mulberry areas. Another obstacle to expansion is custom—the sheer weight of what has been done before in a community which views every departure from the well-worn track with mistrust. In the *achkat* of partially silted tanks, and on the margin of irrigation under river channels, there are thousands of acres of land of which the water-supply though normally insufficient for paddy would be ample for mulberry; the holders are content to raise a scanty and uncertain crop of paddy.

The next point which calls for remark is the negligent and slovenly way in which mulberry is cultivated, and the apparent lack of care about the kind of plant put in. In some places—such as parts of Sidlaghatta, Chickaballapur, Closepet and Kankanhalli—the cultivation is good—but this is the exception. The trouble of selecting good cuttings and of careful planting, timely weeding, digging, and pruning, and the cost of an extra dose of manure would pay themselves several times over in increased production.

We come now to silk-worm rearing, which from the number of the persons concerned is undoubtedly the most important part of the industry. When it is stated that roughly speaking each acre out of the 35,000 now under mulberry gives occupation to about four persons, and brings competence and comfort to a household, the magnitude of the

* Report on an Enquiry into the Silk Industry in India by H. Maxwell-Lefroy and E. C. Ansorge; Vol. II. Present Condition of the Silk Trade of India, by E. C. Ansorge, 1916.

human interest is at once obvious. The average rearer utilises the crop of about an acre of land, either raised by himself or purchased, and with the help of the members of his family rears from four to seven broods of silk-worms. If he has his own mulberry garden, he wants money for improving or cultivating it; if not, he wants money for buying leaves; he wants money again for providing himself with seed cocoons; if he has, as too often happens, miscalculated about his supply of leaves, he wants more money for buying a supplemental supply from garden owners, who aware of the urgency of his need, put their prices up in proportion. So money is wanted at every step, and in the absence of an organization for credit, is got anyhow, at any cost. Interest of 200 per cent is not unknown. The most obvious source of credit is the reeling *sahukar*, who runs a village establishment with a few *charkas*. The rearer gets a loan from him repayable in cocoons at a valuation fixed by the lender, who is usually not averse to making the most of his economic advantage. It sometimes happens—for the use of disease-free eggs is not widespread enough—that the rearing fails through disease, and that the borrower is deprived at one fell stroke of all return for his investment and trouble, and is left without the means of meeting his obligations. This presents an opportunity, seldom missed, of rivetting the fetters. This is a gloomy picture, but by no means overcharged. There are, of course, numerous exceptions due to consistent good luck, or to unusual skill and business capacity, and one likes to think that such exceptions are getting more numerous in recent years; but the majority of our rearers work under the conditions described above, and the fact that the industry lives and thrives in spite of this disastrous mal-organization is eloquent of its vitality and suitability to its environment.

The most pressing want is an organization for credit; next come organizations for purchase of leaves, seed, and appliances, and for sale of cocoons. Here is an undoubted opening for co-operation. That the ryot finds it worth his while to rear even under the existing conditions proves that the industry is remunerative; that he is able to borrow leaves no doubt of his credit worthiness. An association of rearers with

unlimited liability can have no difficulty in getting all the money it wants on reasonable terms. Such an association would be in a position of vantage in buying mulberry and appliances, and in selling cocoons. If some members should have more worms than leaves, there would always be others with more leaves than worms, and an adjustment could easily be effected without waste or inconvenience. The association could lease mulberry enough for its members, and secure them from a sudden rise in the prices of this essential. Should the market be dull, the association could buy cocoons from members at a fair valuation, or accept them in repayment of debts, and get them reeled. It could stock appliances, and keep them for hire or sale.

Perhaps the most important advantage of the association would be its ability to secure a supply of disease-free silk-worm eggs to its members. At present, about two crops out of every five are lost owing to bad seed, and in spite of the best efforts of the Sericultural Department, it will be long before the grainages can fully meet the requirement of the industry. The chief limitations are imposed by want of grainage space, and of staff for such preliminary work as collecting seed cocoons, pairing moths in cellules, etc., which require no specialised skill. A co-operative association could take up these functions, and seek the aid of the Department—which will be willingly rendered—for microscopic selection. This would enable the work of the Department to reach a larger number of people, besides making the association what it should be, a centre of educative and propagandist work. It is needless to dwell on the value to the industry of the interchange of views and experiences of keen rearers drawn together by a common interest.

My suggestions would be incomplete without an emphatic insistence on what I consider to be the most essential step for the improvement of this—as indeed of any other industry. I mean education which fosters a knowledge and love of the calling. The State has been doing all it can to spread primary education, and attempts are being made to give such instruction on agricultural bias in rural parts. I am convinced that it is at least as important to introduce sericulture in elementary schools situated in the silk areas of Mysore.

INDUSTRIAL ENTERPRISE AND CONFIDENCE.

BY M. VARADAIYA, B.A.

IF industries from old established Cotton and Woollen Mills of Bangalore to the great enterprises undertaken to-day, such as the Mysore Wood Distillation and Iron Works, the Factories for the manufacture of Sandal-wood Oil, etc., can be started and, developed in this State, why is it then that in spite of the fact that Mysore possesses many wealthy people the general tendency of the majority of them is still to stand aloof from commercial enterprises? Why is it, again, business confidence has not as yet been established to such an extent as may be desired? The history of the past and the facts of the present as we know them are against finding the sole reason for these in causes such as the climate, the inferior quality of labour or foreign competition. These, of course, all bear their part, but it cannot be denied that there are also other causes which are in part the fault of the majority of the people themselves. Sufficient knowledge, sufficient business experience, sufficient energy has not in all cases been brought to bear in the launching of industrial enterprises, especially the smaller ones. In many cases the vital necessity of sound business organization has not been recognised nor the almost equal importance of thorough technical and expert examination of an industrial project before it is decided to be started. It must also be acknowledged that our commercial enterprise has not in several instances shown the energy and the determination to persevere in the face of set-backs which are essential to eventual success. The Goribidnur Sugar Factory and the Marikanave project may perhaps be cited as instances in point. In most cases, our manufacturers want quick profits; there are very few who understand

or welcome painstaking and often costly and protracted experiments and as it is with the manufacturer, so it is with the worker. He does not readily take to the unfamiliar; he does not welcome a new machine. The average Mysorean is generally so satisfied with his own methods and achievements that he fails to visualize further progress as possible till some other competitor astonishes him with the unexpected results of his work.

Let us for a moment consider how Japan has come to occupy her present high position in the industrial and commercial world. The promotion of the development of industries in Japan is largely due to the qualities which the people of Japan themselves have shown and the way in which they have imported into their commercial enterprise the same hardihood of body and spirit which have made them conspicuous among the fighting nations of the world. Not only have they displayed great pertinacity and perseverance but they have also proved themselves to possess an unusual genius for combination and co-operation. Their largest industries are organized as guilds and the different branches of trade co-operate closely in the common mission of pushing Japanese things against those of the rest of the world. It is of vital importance that we in Mysore should acquire the same qualities. Some of our leading business men have already exhibited these qualities to a remarkable extent; but the large majority have endeavoured to follow in their footsteps without having appreciated the methods by which success is achieved. Where there is lack of thoroughness, lack of vigour and perseverance, lack of technical or business knowledge and the instinct for combination is absent, there is bound to be a failure which will react on the public and check the flow of capital. It is very necessary, therefore, that confidence should first be established if success is to be attained and this confidence can only be justified by results. There has been too

often in Mysore a tendency towards two extremes both equally fatal—one to an excessive timidity and the other to a disastrous recklessness. The one real remedy for both is experience which will convince promoters that success is not to be easily achieved and that only thoroughness in all stages of an enterprise can achieve it and their industrial ventures can be a legitimate and sound outlet for the money invested in them. Success, therefore, rests with the people themselves and there is already evidence in Mysore to show that a keener spirit is being developed during recent years and that the essentials to success are also being slowly but steadily, created.

The Government have also been doing their part of the work. The development of agriculture and industries in the State has been phenomenal. Every effort is being made by Government to make the people reap a rich harvest of the gifts so profoundly bestowed on them by Nature. The Government have been helping the people in providing information as to the sources of raw materials available in the State, the possibilities of their uses for purposes of manufacture, the leading centres of the consumption of the products, raw and manufactured, their market value, etc. They have also by the establishment of the Chamber of Commerce and the Board for Chemical Research and Scientific Advice, set up the necessary machinery for the collection and dissemination of commercial and scientific intelligence which is so essential for the practical work of industrial development, but it is not so easily available to private persons. Assistance is already being given for the promotion of industries by means of technical education. Expert advice is also being given, as far as possible, in regard to commercial enterprise and all available facilities afforded for the investigation of the economic aspects of the schemes proposed to be undertaken. A Central Commercial Museum is in course of formation in Mysore. The most urgent need

that is felt at present is the provision of facilities for a thorough technical and scientific examination of new industries which may with advantage be started in the State as well as an extension of laboratories and equipment for conducting the necessary experiments and researches. This need has already been recognised by the Government and the question of supplying it is at present under the consideration of a Special Committee appointed for the purpose.

Notwithstanding the facilities and encouragement that have been, and will be provided for the promotion of industries, the fact cannot be overlooked that whenever a proposition in which any disappointed promoter is interested is not favourably reported upon, his general tendency is to take the view that those entrusted with the investigation of the proposition have assumed a hypercritical attitude in respect of it. But the truth is that everyone who undertakes the investigation of any project is naturally anxious, and will doubtless welcome every opportunity, to report hopefully about any scheme which he is called upon to examine and that it is very much more pleasant to be able to write hopefully than otherwise. There is hardly any one who is unmindful of his duty to the Government and the industrial and commercial interests of the State; but his desire for the expansion of industries ought not to warp his judgment with regard to any proposed project. The general ambition of every right thinking person who undertakes the investigation of a project is to report what is accurate. Whether his report is favourable or not to the investor is not material to him. He is always particularly anxious that it is absolutely correct and conveys an accurate impression of facts as they exist. His sole aim is to guard the public against that form of piracy which leads to general belief in the success of the undertakings put forward for his examination. It is, therefore, only by means

of accurate reports that the confidence of the general public can be won.

At the same time we cannot ignore the fact that the path of the pioneer of any industry in Mysore has generally been a thorny one. There have been many failures before success has been achieved. Any one who cares to read the history of the gradual development, for instance, of the Gold Mining industry on the Kolar Gold Field, will see how true that is. The risk of undue competition in the production of various articles of utility from low priced and abundant raw material is the first drawback which generally threatens the investor in any industry but the stage of equilibrium can be reached and competition need not alarm any producer if he selects his sphere of operations with due regard to the position of the sources of his raw material and of his markets, provided that care is always taken to maintain the standard of the product at an invariably high level. If rival concerns spring up simply because some efficiently conducted business shows signs of prosperity, there is waste of capital and energy which has no public justification and is injurious instead of being beneficial. No new project, large or small, should, therefore, be attempted without satisfactory proofs of its need and utility. It is very important that no waste of money, labour or enterprise should be permitted or condoned, but once an enterprise is decided upon it should be backed and financed for all its worth.

It is very gratifying to note that among the diverse activities now being carried on even the minor industries, especially those which have arisen since the organization of the Mysore Economic Conference, are preparing the minds of the people for larger enterprises. Looming in the distance are industries for (1) the manufacture of Sulphuric acid, (2) Cyanamide, (3) Paper-pulp, (4) Pencils, (5) Preparation of dyes, (6) Cattle and pony breeding, (7) Fruit-canning, etc., and as well as the secondary industries to be derived from these. Whatever care may have been taken in the preparation of a project there may still be unexpected obstacles and it is particularly at this point that Government is looked up to for assistance

in what are in fact industrial experiments. This can be rendered in more ways than one. The Government may afford special facilities by providing, or at any rate facilitating the provision of, finance for such trial experiments or by conducting the experiments itself in the way of providing for the producers and manufacturers facilities for economical work and especially cheap transport or by means of suitable agencies for the most favourable marketing and distribution that is possible for their supplies.

There are obvious difficulties which require to be faced. There is the difficulty in all such schemes of how far the Government can spend the ryots' money for such purposes. There is also the difficulty of avoiding any appearance of favouritism in the selection of concerns of industries to be assisted by the provision of funds. Even in the case of the Government itself pioneering the industries, there is the difficulty of avoiding interference with private enterprises. But the end to be achieved is of such great importance to the industrial advancement of the State that it warrants such risks and difficulties. What is now required is the preparation of practical plans of campaign which the people can with confidence put into practice and which are so necessary for strengthening the industry and commerce of the State for the competitive struggles of the future. The most useful thing that could be done at the present moment appears to be to concentrate attention upon the construction and details of schemes of this kind.

The main items which appear to require immediate consideration are:—

- (1) Extension of provision for industrial research;
- (2) Devising means for the utilization of the various resources of the State;
- (3) Provision of better facilities for investigation; and
- (4) Co-ordination of industrial investigation and elimination of overlapping in such work.

Our people should also be taught to co-operate in organizing business so that we can enter the World's markets with a sufficiency of goods of the right kind at the right place. The more efficient an industry becomes in all its branches the greater will be the confidence of every individual engaged in it.

A SCHEME TO PROVIDE HOME GROWN TIMBER.

THE Final Report of the British Forestry Sub-Committee of the Re-construction Committee (Cd 8881) has been issued. It recommends a comprehensive scheme for national afforestation and the Minister of Re-construction is carefully considering how far and in what way effect may be given to the proposals. The Sub-Committee was appointed by the Prime Minister in July, 1916.

The Committee recommend a scheme of State planting which in an emergency would keep the United Kingdom independent of imported timber for three years on a present day war basis of consumption. The total cost for the first ten years would be about £3,500,000 allowing not only for the direct cost of afforestation but for all incidental charges. Against this expenditure must be considered not the financial return on the capital, which, though certain, would be distant, but the sum that it has cost us during this war through the enormously enhanced prices of imported timber. During 1915 and 1916 alone we paid £37,000,000 more than its pre-war value for the timber we imported. "Such a sum," say the Re-construction Committee, "would cover several times over any possible loss which could be incurred on a well-conducted afforestation scheme."

More important from a war point of view than cost was the amount of tonnage absorbed by these imports, which the Report states at 7,000,000 net tons of shipping, equivalent to approximately 14,000,000 tons dead weight. The proportion got from the empire fell from 22 per cent to 20 per cent in 1899. The practical utility of afforestation at home is proved by the fact that 90 per cent of our imports are the soft woods of coniferous trees which could be grown in this country.

The Re-construction Committee estimate that there are not less than three and probably more than five million acres of land utilised for rough grazing but capable of growing first class timber of the same character as that imported. Of this area 2,000,000 acres could be put under without decreasing the Home production by more than 0·7 per cent and it would ultimately give employment to at least ten times the number of men employed by grazing.

The Scheme which the Committee recommend proposes to afforest 1,770,000 acres. Taking eighty years as the average rotation, two-thirds of the whole should be planted in the first forty years. From the 15th year onwards the scheme would begin to provide pit-wood from the quicker growing species on the better kinds of mountain land. By the fortieth year the plantations made in the first ten years alone would contain enough timber to keep our pits supplied in emergency for two years at the present rate of consumption. The total cost for the first forty years may be £15,000,000. After that time the scheme should be self-supporting. The whole sum involved is, therefore, less than half the direct loss incurred during the years 1915 and 1916 through dependence on imported timber.

The report points out that if the Government should wish to employ the maximum number of men discharged from the service during the demobilisation, the rate of planting might be greatly speeded up. The Committee propose that at least 150,000 acres of the initial 250,000 should be planted direct by the State action, and that for the remainder (left to local bodies and private land-owners) there should be State assistance and control. "We do not believe (says the Report) that State afforestation means expensive and inefficient action. On the contrary we have the long experience of all the countries in which the afforestation has reached a high pitch of development, and the promising methods of management in certain of the Crown woods of recent years, to prove the opposite."

The Committee's scheme of the State control and management is to create a

special authority, a forestry Commission represented by a Parliamentary Commissioner in the House of Commons. The Commission would consist of six members, three of them whole time salaried officials, the others unpaid. There would be consultative committees for England, Wales, Scotland and Ireland.

For carrying out the scheme, forest officers, foresters and foremen would be required and would have to be trained. Forest officers would be inspectors engaged on survey, planting plans, supervisions of planting, and advisory and experimental work. It is estimated that the service would require sixty officers by the fifth year of operation. Probably twenty reliable men with a good knowledge of British conditions, would be available at the outset. These men would have to be university trained and the standard necessary is that represented by a good honours degree in science.

It is recommended that the forestry commission should undertake the general control of Forestry education, and must maintain "demonstration woods" for practical work.

The increase of population on the land under the Committee's scheme would be considerable. It is estimated that it would result ultimately in the settlement on the soil of not less than 25,000 families, or 125,000 persons in all.

The necessities of war govern the whole report. A few passages may be quoted from the general summing up of the military case for afforestation:—

"We have, to speak plainly, run risks against which every other considerable country has long taken care to protect herself."

The war has disclosed no demand which could not have been satisfied by timber grown in this country with its favourable soil and climate and abundance of waste land."

"It is only a question of time before the whole of the country's growing timber which is fit for commercial use must disappear. The result is depletion which the Government cannot afford to neglect. This country poorer in timber at the beginning of the war than any other European country except Portugal, will be more destitute still at its close. Even if acre felled is replanted it will be many years before the present output can be repeated."

ECONOMIC RECONSTRUCTION* A REVIEW.

BY THE EDITOR.

A couple of years ago, we noticed one of Mr. Peddie's books in this *Journal*. The present is, in some respects, a continuation of that. If that dealt with a "National System of Economics" the present one seeks for the application of its vital portion to the British Reconstruction work after the War. Mr. Peddie is a man of convictions. He does not mince words when the occasion requires it. When he urges that all sections of the body politic should harmoniously work for the good of the country, it seems to us that he has a correct view of the difficulties of the problem confronting us, whether in the political or in the industrial world. Mr. Peddie has no belief in Mr. Karl Marx and his doctrines; nor has he any the faintest suspicion that those who seek to apply them to the practical problems of to-day are foredoomed to fail. At the same time, Mr. Peddie is a confirmed disbeliever in *Laissez-faire*. "I believe with Colwell," he says, "that the extent to which Governments have gone, and must necessarily go in protecting and promoting industry, clearly contradicts the idea that men and business should be allowed to go their separate ways without regard to the general welfare of society as a whole." He thinks that there must be laid down for general guidance certain principles which should "run through and be the foundation of the laws of the nation," but subject to which each man may then "pursue his own interests in his own way." While the war has demonstrated, more than anything else, that the social ideal of internationalism can never be practical, the tendencies manifest

* *Economic Reconstruction*—by J. Taylor Peddie. Longmans Green & Co., London and Bombay. 68s. 6d. net.

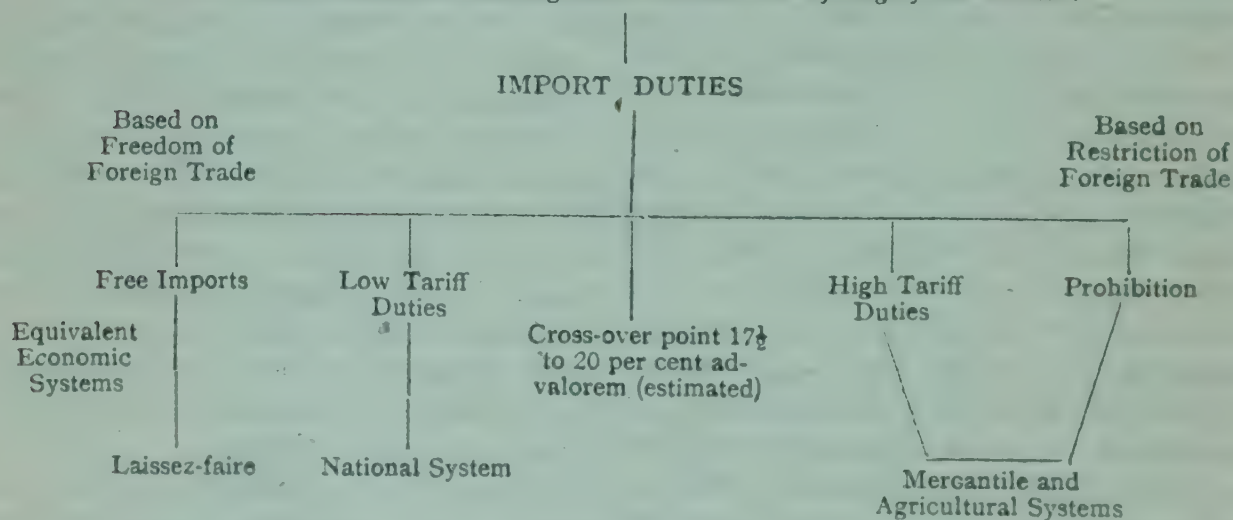
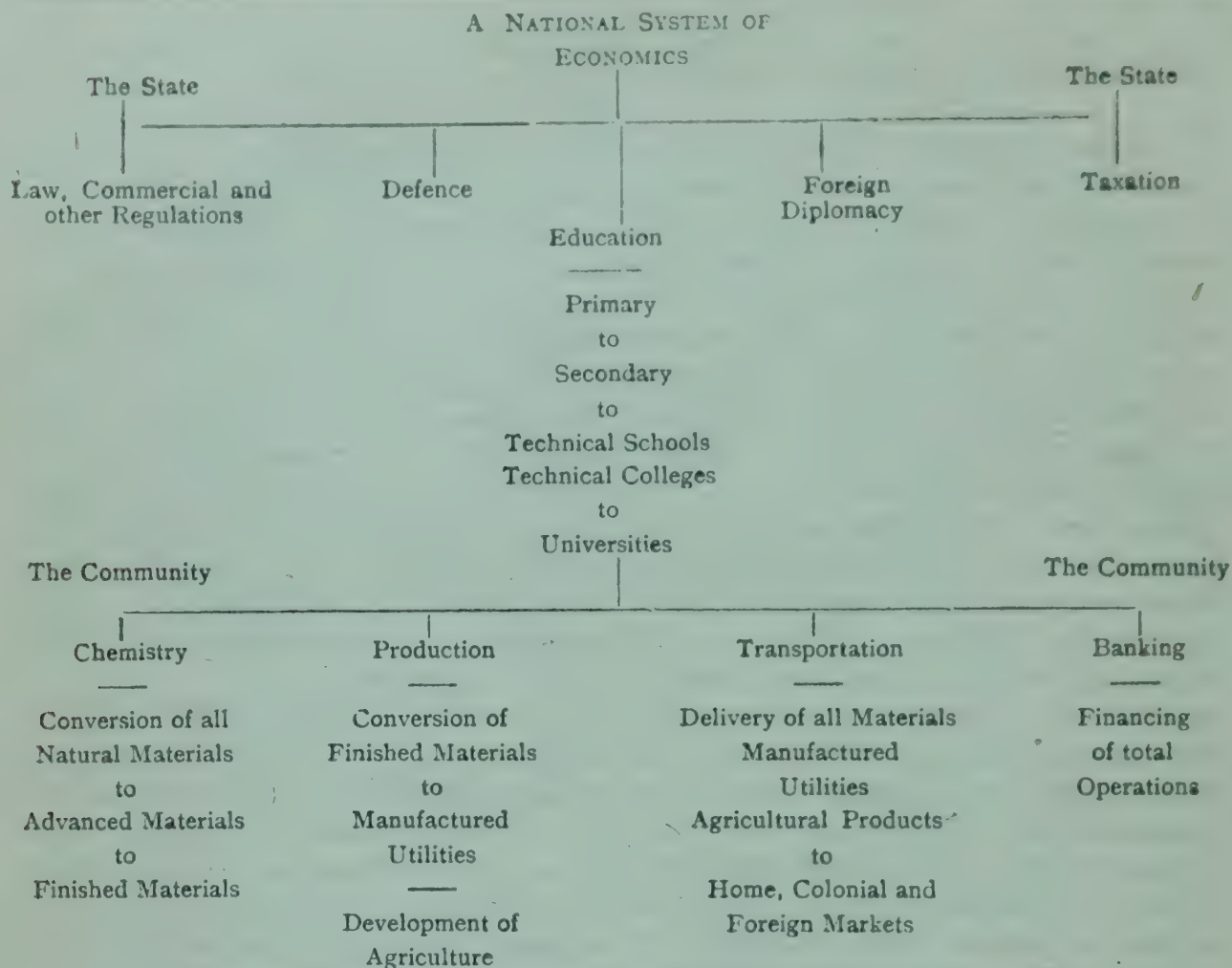
to-day do not confirm altogether Mr. Peddie's conclusion that the proletariat is not likely to push its theory to its logical conclusion. Mr. Peddie's central idea is that the best corrective to the German military aggressiveness and world domination is to develop the nation's productive power. "History has clearly demonstrated," he adds, "that nations have only been destroyed by being impotent in that respect." Mr. Peddie is apparently a business man and the reader will find that his suggestion is born of convictions deeper than were bookish theories.

Mr. Peddie's robust common sense repudiates the general unwillingness of the average Briton to recognize the economic factors embedded in politics. Politics, in his opinion, is nothing more than practical economics, in the truest conception of that term. Again and again, he reiterates this idea. We shall only quote a passage or two to make our position clear. He says at page 222:—"As a race, the British people comprehend the science of politics better than any other people, but they have failed to perceive that political science and Economic science go hand in hand and are inseparable; that in reality they constitute national power, and that, therefore, they should be instruments which our representatives in Parliament, and the Government, should employ with such wisdom and discretion as they may possess in advancing the higher interests and civilization of the race." Concluding a long quotation from Burke in which that great statesman expatiates on the wrong of Ireland, he says again: "Is it too much to expect that our modern politicians may take to heart Burke's simple doctrine; that they will not go to the House of Commons and regard politics as a great game, not look up on the lives and welfare of their constituents as pawns in the game? The Economic welfare of the citizens they represent should ever be their first consideration. Political science, which we contend embraces the economic as well, is designed for the good it can

do to society, and for this reason it must ever be regarded as a means to an end. To look upon human beings as being mere fractions of a horse power, as constituent elements in a process or the development of a science of wealth and to use them as such, is, in our view, one of the greatest crimes that has ever been perpetrated upon humanity." Whether this is so or not, we need not pause to consider here; it is enough we note Mr. Peddie's view point. Much of it may sound good politics but is not economics. That, however, is a matter that does deter Mr. Peddie from offering his views, for, as we have already remarked, he has the courage of his convictions, and can quote even Adam Smith in support of his views.

Mr. Peddie's general idea being what it is, it is not surprising that his application to practical problems of to-day show a wide divergence with current notions on them. That is as it should be; it is valuable because it shows a side of the picture that is usually not perceived by most arm chair Economists and politicians. Mr. Peddie is seen to advantage in his chapters on capital and consumption of capital, on the redemption of the national debt, on art, economics and world politics and on Ireland and the National System. We would suggest to the interested reader that he should turn to the book itself if he wants to have some insight into Mr. Peddie's hard headed way of battling with these topics. He views them from the point of view of a business man bent on taking a comprehensive, not a partial or one sided, view of things.

Appended to Mr. Peddie's book is an interesting table indicating in graphic form his system of Economics—the system which he terms "A National System of Economics." We reproduce the same on the next page as it well illustrates the interdependence of several things that affect national well-being but which are commonly though erroneously thought of as forming separate water-tight compartments.



ECONOMICS IN THE WEST.

Indian Industrial Conditions.

London, 13th February, 1919.—It is a curious fact that in the copious comments made in reference to the economic programme of the Peace Congress there is an almost utter absence of mention of Oriental industrial conditions. There are plans in plenty for re-modelling the European Industrial world, programmes beyond number for introducing an international millennium in which the working man will work a minimum number of hours for a maximum rate of pay. But not a suggestion that the whole subject is enormously complicated by the existence in half the world of standards and conditions of labour utterly incompatible with these idealistic schemes. How, for example, could you possibly, enforce a 40 hour weekly in India or pay a minimum £1 (Rs. 15) a day to workmen which are points in some of the Labour Charters seriously put forward? In no Eastern country could anything approximating to such conditions be enforced. If that be the case then how is the new International system to be introduced? To my mind the whole idea of international reputation of industry is utterly impossible unless you are to associate with it a method of coercion utterly repugnant to every notion of honesty and fairplay. In point of fact to achieve even the appearance of success there would have to be a boycott of Oriental goods in markets dominated by the League of Nations accompanied by repressive measures against shipping. At this time of day we are not in the least degree likely to see anything of this kind, I am certain, and so it seems probable that this whole scheme of international industrial regulation will be abortive.

At the same time Indian industrialists will do well to give heed to their ways lest they legitimately provoke some form of

interference. It would be ridiculous to suppose that wages and conditions of labour in India can be levelled up to the European, still less to the American standard, but on the other hand there is no reason why Indian artisans should be housed like cattle and paid a mere pittance for their sometimes really skilled labour. Increased wages, lowered hours, improved living conditions might all be introduced not merely without detriment to the future of Indian industry but with positive advantage to it. The wide world over it is the experience that well paid labour is not in the long run costly. Where good wages are given the manufacturer gets a better return for his outlay in the shape of higher workmanship and increased output. In India improved industrial conditions would almost inevitably attract to the factories a better class of labour than has hitherto come forward in any volume. You would soon have in your country what we have here a solid useful class of mechanics capable of adopting themselves to new conditions and able to get the highest return out of machinery. I have no doubt that the recent labour disturbances in Bombay have opened the eyes of those concerned to the necessity for a new departure. They must have seen that India no more than Western countries can evade the obligations imposed by the situation left by the war. The barriers which once separated East from West by a profound division have broken down under the strain of a mighty conflict. As the Spanish influenza has spread to the uttermost ends of the earth from the battle area^a so has the spirit of a new labour dispensation. It is knocking at the doors of capital in countries widely separated with an imperiousness which will take no denial. Those who give heed to the warning summons will have no cause to regret the sacrifices they may have to make; but those who linger in the background under the shadow of the old system will most certainly be overwhelmed.

THE PROCESS OF RECONSTRUCTION.

Amid the continual rumbling of the labour machine under the influence of repeated strikes we hear little of the processes of reconstruction but progress is nevertheless being made and substantial progress too. Steadily, though unobtrusively, our war factories are being turned over to civil purposes and already—in some cases almost literally—the world is being converted into the ploughshare. In many instances the transformation is being effected with quite a minimum of trouble. Thanks to foresight in the early stages of planning and equipping these mammoth establishments which are dotted all over the country, they are now readily converted to new uses, while there is plenty of labour as a rule to work them. Some of them are being devoted to the useful work of replacing German industry in various departments in which she had a dominating voice before the war. In a series of highly instructive articles which the great midland organ, the *Birmingham Post*, has been publishing recently the public have been given a useful insight into some of the newer forms of enterprise into which the country's industry has been directed by the influences of the war. From these articles I gather that Birmingham has established a practically new industry in the shape of a brass stamping process. Here instead of moulding brass and turning the cast article afterwards the material is stamped or pressed to the immense saving of labour and metal by the reduction of work. The process was in vogue before the war, but it was largely from Germany that the brass mouldings were obtained. The war, however, had not been long in progress before our Government found the extreme value of the method as applied to fuse bodies and shell parts of all descriptions and they installed extensive machinery in the Birmingham district to produce the needed articles. So heavy were the calls upon the factories that one establishment alone

produced 200 tons of stamping a week. Now the machinery almost without a visible effort is being employed for mouldings of a general character a wide demand for which is confidently expected. Another of Birmingham's gains by the war is a detinning industry. Here tinsplate scrap and disused tins usually cast aside as useless are taken in hand, put through a process which extracts the tin and leaves the other metal readily to be dealt with as a valuable trade product. Before the war tins were exported to Germany in vast quantities for detinning, but this is not likely to happen again. The tin extracted from the waste is to-day worth £250 a ton. During the crisis of the war it fetched £360. A curious commentary on this is the fact that not long since manufacturers were accustomed to paying 5/- per ton to persons who would take old tin refuse away. I have no expert knowledge on the subject but it appears to me that there is room here for a new Indian industry. A plant established in a good centre—Bombay and Calcutta—would almost infallibly be able to attract to it a sufficient quantity of tin refuse to yield a good return on capital.

● THE MAGNETO INDUSTRY.

The case of the magneto industry stands alone as a war created interest. In this letter I have referred to it before but I have no hesitation in returning to the subject because of its importance. When the war cloud burst we were in this matter as in so many others under the German thumb. We produced few magnetos ourselves and complacently allowed Germany practically to monopolise a manufacture which gave her the control of a vital part of motor machinery. Fortunately our scientists were equal to the call made upon them to produce an efficient substitute. One of the initial difficulties which had to be faced by the experts, says the writer I have referred to, "was the production of suitable metal for making the permanent magnets in which the armature revolves and sets up the voltage for

transmission to the sparking plug. Tungsten was what the Germans used for these magnets. Our own chemists had to find new alloy steels which would fulfil the same function. The research laboratory established at the Birmingham Council House by the enterprise of the Gas Department rendered valuable service in this quest, carrying out a great many experiments. Works were equipped in the midlands for giving effect to the scientist's discoveries and gradually the German magnet was replaced by a home production which is pronounced superior in its vital parts to the German made article. Moreover, we have made ourselves independent of the American magnets which was making rapid headway when the war broke out. "Magnetos are manufactured almost entirely in Birmingham, Coventry and Rugby. The combined output of all the firms at present engaged in the industry is about 30,000 a month as compared with about 100 before the war. And this is not all. Present production it is expected will be doubled in the near future for our manufacturers have now a complete grasp of essential factors and will not be content merely to satisfy domestic needs. Before the war Germany is believed to have exported 24,000 magnetos a month so that there is ample scope for the operations of this promising new industry.

IRON AND STEEL TRADE.

Amongst the certainties of the industrial future is a great boom in the Iron and Steel trade. In the world wherever you look there is evidence of coming huge demands of these indispensable materials. Railways are everywhere needing repair and equipment, bridges require to be built, shipping constructed, and a hundred and one needs in every department of life are craving for supplies of metal. How the increased demand will be met with supplies is one of the most interesting problems of the future. Great Britain during the war increased her steel production from 7,500,000 tons to 10,500,000

tons, but she only exported last year 1,617,000 tons against a pre-war shipment of 5,000,000 tons. The question is whether she will be able to sustain her record of construction and recover her lost hold on world's markets. If she is true to herself there ought to be no doubt on this point. Belgium which has been practically wiped out for the time being as a producer exported largely before the war; Germany had to her account an export of 6,000,000 tons and Austria was also a large competitor in the world's markets. There is here a large gap that has to be filled quite irrespective of exceptional requirements for reconstruction. But as far as Great Britain is concerned much turns on the labour question. If she has to pay inordinately for her coal and labour she will scarcely be able to meet the competition of rivals like the United States who are not so severely handicapped in these respects. Time will show to what extent British genius and capacity are equal to the difficult situation that exists. If I would hazard a prophecy it would be that a way will be found out of the present impasse and that in the end British industry will settle down to the new conditions with a determination not to be beaten. Meanwhile, the Indian steel trade has an opportunity which it will surely not miss. Her brilliant war record carries with it a suggestion of future possibilities which a few years ago would not have entered into the thoughts of the most optimistic. Her steel production, already respectable, will almost certainly grow to huge proportions if nothing untoward occurs to interrupt progress. But here as in Great Britain there is the intangible factor of unrest to make us cautious when we seek to estimate her chances of profiting by the position that has arisen in consequence of the war. In the main, however, the outlook is auspicious and we have reason to hope for the best in the growing sense of responsibility which pervades the best type of Indian thought and which is nowhere more conspicuous than in the ranks of industrialists.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

America's Huge Automobile Production

Washington, D.C., U.S.A., 10th March, 1919.—According to a report just made public, the total number of people employed in the manufacture and sale of automobiles in the United States aggregate 1,930,000. Of this total number 580,000 are in automobile factories, 1,020,000 make parts and accessories and 230,000 are employed by agencies and garages. This number equals 10 per cent of all the people engaged in mechanical and manufacturing industries of the United States.

The motor car business, therefore, supports more than 3,000,000 people. This population would fill a city half the size of New York, as large as Chicago, twice as large as Philadelphia, four times the size of Boston or New York, or ten times as large as Minneapolis, Los Angeles or Washington. It more than equals the population of California, Georgia, Indiana, Iowa, Kentucky, Minnesota, New Jersey, North Carolina, Tennessee, Virginia or Wisconsin.

The salaries and wages of those employed in the automobile producing industry aggregate nearly \$800,000,000, of which the automobile factories pay \$300,000,000; parts and accessories people \$400,000,000, and the dealers and garages \$100,000,000. These totals exceed twice the entire annual revenue of the United States post office and seven times that paid for the transportation of the mails.

Prior to the war the wages paid in the automobile industry exceeded the government's ordinary expenses and were equal to three-quarters of the government's ordinary receipts.

The total capital invested is \$1,256,000,000 which sum is equal to the total outstanding capital stock of the nine greatest American

railroad systems combined. Moreover, the investment aggregates three times as large as the outstanding capital stock of the entire Standard Oil group of 35 companies, and exceeds the capital of all the national banks at the end of 1917. During the year 1918 there were more than five millions of cars in use in the United States. At an average of about 1,000 miles per year, carrying say three passengers each, the total passenger miles covered would be more than 7,000,000 times across the continent and nearly 2,000,000 times around the world.

During 1918 the American railroads carried over 1,450,000 passengers, but to have equalled automobile mileage they would have had to carry each passenger at least 20 miles. The passenger miles travelled by automobiles exceeds those of street cars and steam railroads, and a railroad authority states that the seating capacity of motor cars is greater than that of railroads and street cars combined. He stated that there are 55,000 steam passenger cars in use, averaging 60 persons a car, or a total of 3,300,000. The total seating capacity of motor cars, on the other hand, is at least 25,000,000.

A FOLDING HAND-CART TO PASS THROUGH DOORWAYS.

There has recently been invented a hand-cart which, when not in use, can be folded up to pass through any ordinary doorway. It is an idea which is attracting quite a little attention. The parts are framed together in such a way that there is no need for taking down or loosening any of the joints. The plan is to simply fold the bottom of the cart upwards and then the sides fold together carrying the wheels closer but still leaving them so that they will roll along and carry the cart. The framework consists of the sides with three cross-rails, each in two parts, hinged together.

The side pieces of the cart are shaped with hand grips on each end, and are finished with shaped blocks on the under side to

raise the body of the cart to a convenient height.

The axle for each of the cart wheels is forged. These pieces are fastened on the under side of the shaped block attached to the frame. The vertical part is long enough to extend over the frame piece. When locating the axle pieces they are placed opposite the centre of the middle cross piece in the frame.

When these ingeniously-constructed carts are extended out ready for use the sides are held apart because the bottom of the cart is a neat fit between the side pieces of the frame. For convenience the bottom is made in two pieces, each hinged to the side of the cart.

DOING RIVETING ELECTRICALLY.

The pneumatic riveter was a great invention. It expedited steel assembly work. But why do we still heat the rivets on a forge fire? And the heater—why must he toss the heated rivet to a man twenty or thirty feet away from or above him, who must deftly catch it in a bucket? Why must the rivet be handled again, placed in the rivet hole, held in position while the riveter is set to work upon it, the rivet chilling every moment?

Says an American Engineer: "I want to see the riveter place the rivet in position cold. On his pneumatic machine would be a spring device that would hold two or more carbons in electrical contact against the protruding rivet. The plunging or hammering function of the riveter machine would not in any way disturb the contact, because the spring part is attached to the hand part of the machine or the portion that is not in action. The wire would be attached to the riveter, and the other pole-wire to the dolly-bar or some solid backer against the riveting is done.

"Naturally, there are some details to study and difficulties to overcome. The current requisite to heat the rivet to the right point, the resistance, and such matters must be determined.

"Provision must be made for the protection of the operators, for relaxing the spring so as to remove contact for the last few finishing strokes, and for the best form of contact, which will have to be carbon, as far as material is concerned.

"Electrical rivet-driving would keep the rivet hot to the very last. The metal would be more malleable and would fill every unevenness of the hole. The percentage of poor riveting would be negligible.

"The points of contact are so close to each other, and the rivet is of so different a quality from the plates, that the current would naturally flow directly to the spot where it is wanted.

"Electrical heating will make a rivet so hot, so plastic, that I doubt if a riveter or hammer will be necessary. Simply heat the rivet to the right temperature and force it into position and shape. A sort of compressive action will be all that it will need.

"Electric riveting would mean comparatively little cost for current, infinitely greater speed, much better work, and the cutting off of two men to every machine."

TEMPORARY REPAIRS ON A LEAKY BOILER.

A temporary repair on a leaky boiler can be made by cutting out the leaking part! Often this is the only way to avoid a long delay and a shut-down. Though the fuel expense is increased a bit, the saving until repairs can be properly made or new equipment received fully justifies the expedient. In the case of a sectional boiler, it may be found that a section has sprung a leak through a sand-hole right over the grates. No kind of plug will keep the water off the fire, but by cutting out the mud drum and steam connections and screwing in plugs, the other part of the boiler may be operated as before.

With a leaky tube in a boiler that furnishes steam for power, it is often impossible to shut down during the week long enough to put in a new tube, but a taper plug may be driven in each end of the tube any night; then,

if these are made with a hole through the centre and a rod long enough to pass through both and allow a nut at each end, the plugs may be kept securely in place until permanent repairs are made. Such repairs are not to be encouraged; but, in these days of unusual delays and high production, they help greatly in a pinch, and if well done and the boiler is carefully watched they can do no harm.

HANDLING HOT LIQUID STEEL.

It is conceded that the most difficult and dangerous problem in the large steel mills is the handling of the intensely hot liquid steel after it is made in the steel-furnaces. Contact with it means certain and instant death, and there is also danger of fire at all times from the metal.

After it is ready to be tapped from the furnace in which it is melted into a red-white molten mass and purified, the metal is allowed to flow into a large pot or ladle. These receptacles are suspended from travelling electric cranes. The ladle holds about fifty tons of liquid steel.

After it has reached this ladle it must be transferred to the molds—a dangerous and exacting operation. In order to do this the red-hot liquid metal is allowed to flow from a hole in the bottom of the ladle, and this hole is opened and closed by a lever. This lever is a specially designed piece of mechanism which is attached to the outside of the ladle, and which raises and lowers a long stopper or plug inside the ladle and attached to the arms of the lever reaching over the top of the ladle's side.

HE NEED NOT GO IN WHEN IT RAINS.

A motorist will not make for the nearest garage or other protection when it rains, for his seat within the car protects him from actual contact with the rain. But riders of bicycles and motorcycles have no protecting covers and are unmercifully soaked by sudden rains. The result is that they must seek shelter, and continue their journey only when the weather gods see fit to permit it. This

unpleasantness in cycling has been overcome by a recent invention.

Cycling enthusiasts have every reason to welcome the combined cycle raincoat and cover for which a patent has just been issued in Washington. The waterproof coat is large enough to cover not only the rider, but also the handle bars, pedals, driving mechanism and saddle of the wheel. A high collar, which may be turned up and fastened in that position, fully protects the head and neck of the rider.

The coat opens on the side, and is held together securely by snap fasteners. The closing seam of the garment is made watertight by providing for two flaps on one edge, between which the other edge is placed when the coat is buttoned. The coat has no sleeves. To enable the wearer to unbutton the fastenings a side opening, protected by a flap, is provided. The front part of the roomy and tent-like garment fully covers the handle bars and is attached to them and to the front fork.

While most highly serviceable there is nothing complicated about this rain-coat garment. It is easily put over the shoulders of the rider, and the driving and steering mechanism of the wheel and as readily and quickly fastened to the front fork and the handle bars. The rider can, with but little effort, get out of the garment without detaching it from the machine.

WITH THIS SAW ONE MAN DOES THE WORK OF TWO.

In structures of various kinds it is often necessary to cut piles, stringers and other timber after they have been put in place. Frequently, the sawing has to be done in places difficult to reach, and under conditions that make the handling of the saw extremely difficult and awkward. It required at least two men to do the work with the old-fashioned cross-cut saw, and it was slow work at best.

The recent invention of a cross-cut saw which can be operated by one man is of

considerable importance and value, especially at the present time. This device consists of a light steel frame which is clamped in position against the tree, pile or poles to be sawed. The saw-blade, which is pressed in contact with the wood by a string, is attached to a slidable rod which is moved back and forth by an upright lever worked by hand. The mechanism is extremely simple and cannot easily get out of order.

The method of operating this saw makes it possible to use it in places and under conditions that would preclude the use of the old-style saw. Trees may be sawed close to the ground, which means an appreciable saving in lumber. Piles may be cut flush with the cross timbers of a dock or pier, and in the case of necessity it is even possible to saw piles or posts under water with this ingenious saw.

The saw can be adjusted as to pressure and length of stroke, and one man can easily do twice the work that two men can accomplish in the same time with one of the old-fashioned cross-cut saws.

A HOME-MADE AIR PUMP FOR AUTO TIRES.

Inflating tires quickly while on the road may be accomplished by the well-known method of using one of the engine cylinders as a compressor. To take the place of the spark-plug on one cylinder—preferably the one in the rear—make a connection for the air hose, using a nipple having the same thread as the spark plug, and on this turn an ordinary pipe coupling. The spark plug is turned into the upper end of the coupling. This provides a means of tapping the coupling for a side outlet, into which are fitted a small brass cock, a ball check valve, and finally the hose connection.

When it becomes necessary to pump a tire connect the hose with the check valve to the cock, turn the valve, and let the engine run.

NOTES.

The Progress Report of Forest Administration in the Punjab for the year ending the 30th June, 1918, in the chapter relating to research and experiments, says that the Himalayan spruce and silver fir are being tested as to their suitability for aeroplane manufacture; and for this purpose a large number of trees have been cut in Bashahr, and a consignment of timber despatched to the Aeroplane Factory at Lahore. Expert opinion on this consignment is awaited. It has been found very difficult to get any large quantity of timber sufficiently free from knots. In connection with this work the question of the so-called "red heartwood" of the spruce has come prominently to notice. This "heartwood" will not float, and has to be left in the forests; and as it is present in large quantities it seriously affects the yield of the forests. Its origin and character have been proposed for investigation by the Forest Research Institute. Walnut timber extracted from Bashahr for trial in the construction of aeroplane propellers was pronounced by experts to be unsuitable for that purpose when converted green. Several species of moss found in Bashahr have been tested as to their suitability for surgical dressings. One species is well reported on by the medical authorities; and experiments on a large scale are being made with it. Experiments in Kangra have shown that the coppice felling of ban oak (*Quercus incana*) in that division can be carried out at any time of the year without any difference being discernible in the vigour of the resulting shoots, and further that it is unnecessary to dress the stools, since practically all the shoots come from dormant buds and not from the cambium layer. Two sample plots have been laid out in Kangra to ascertain the correct rotation for cutting bamboos and the degree to which clump-clearing

should be done. In Lahore the experiments regarding the fertility of shisham seed obtained from coppice shoots, and the efficacy of early thinnings in irrigated plantations are being continued. The Burmese species of bamboos, mentioned last year as having been tried in Kangra, have not so far done very well. A further supply of seed obtained from Burma this year failed to germinate at all. Of the various exotics tried at Dharmasala Spanish chestnut, *Cryptomeria*, *Robinia* *Acacia dealbata* and camphor—none can be regarded as successful. *Robinia* continues to do very well in Simla. It is particularly useful for clothing unstable slopes where excessive weight of trees is undesirable. The various species which were tried in Changa Manga as substitutes for shisham standards were all frozen down and failed completely.

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We note from the Report on the Administration of the Central Provinces and Berar for the year 1917-18, that the post of Director of Industries was separated from that of Director of Agriculture, and the former officer was appointed Provincial Controller of Munitions in addition. His chief duty in the latter capacity was to co-operate with the Forest Department in the exploitation of tanstuffs and lac and to endeavour to improve the indigenous tanning industry. A Tanning Expert has been appointed, whose primary function will be to secure the better drying of hides and their better treatment in the existing small tanneries. Plans have also been made for re-organizing the big slaughter-houses in the north of the Province, and it is hoped that they will become the source of supply of a large local up-to-date tannery. The Textile Expert, after very hard and up-hill initial work, has succeeded in introducing large numbers of improved looms among the local handweavers, which add at least 50 per cent to their daily outturn. He has demonstrated also that the wool of the local sheep can be

utilized for a high quality of home-spun tweeds and that there are great possibilities of establishing an extensive cottage industry of spinning wool yarn to supply a weaving factory. The experimental factory has already been taken over by a local business man, and the expert is arranging to carry his experiments further so as to render this nascent industry, which is at present dependent on Cawnpore warp, self-contained and self-supporting.

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We take the following from the Annual Report on the working of Co-operative Societies in the United Provinces of Agra and Oudh for the year 1917-18 :—Co-operation among the small trading and artizan classes cannot be said to have taken root yet. Their position and outlook are different from those of the agriculturists. Their professional skill is a permanent asset, and loans and credit have, therefore, not the same value with them as with the latter. They are consequently more lax in their dealings in money matters. They are, moreover, content to work for others, as long as they get a living wage, by sheer habit of generations, and find it more convenient to borrow from their employers whom they repay in kind, than to have the botheration of organizing their resources. The comparative ease, too, with which they can change their stations militates against their position as good members of societies. For all these reasons these classes will require a great deal more of teaching and organizing than the agriculturist, before they can appreciate fully the benefits of co-operation and profit by it. My predecessor indicated in the last year's report that this problem could only be tackled, in the existing circumstances, by departmental staff specially allotted to the task. The last Provincial Conference also discussed the matter and decided that a special organizer with commercial experience was needed to educate and organize urban

societies. The matter is under the consideration of the Government at present.

The following statement compiled in the Department of Statistics, India, shows the quantity and value of cardamoms imported from foreign countries by sea into British India during January, 1919:—

Article and countries of consignment.	January, 1919	
	Quantity	Value
SPICES.	Lbs.	Rs.
Cardamoms—		
From Ceylon ...	1,248	895
„ Turkey, Asiatic...	119	120
Total ...	1,367	1,015

Turpentine oil and rosin are already being produced on a commercial scale in India by the distillation of pine rosin. A new source of supply, which though comparatively small may be valuable, especially for Indian use, has now been found in Indian frankincense or olibanum. This material is obtained by the natives by making incisions in the stems of *Boswellia serrata*, a tree widely distributed throughout the dry-zone forests of Central India. The resinous substance which exudes from the cuts contains a kind of turpentine, a resin and a gum. Investigations of the methods of separating these constituents in a marketable form, as to their commercial uses and value and on the methods of tapping the tree, have been conducted since 1912 by the forest authorities in India in co-operation with the Imperial Institute, the results of which have been published recently in a paper by R. S. Pearson, Forest Economist, and Puran Singh, Chemical Adviser at the Forest Research Institute, Dehra Dun. The general conclusion reached, based on the

results of numerous trials carried out in India and in this country by the Imperial Institute, is that the turpentine oil is equal to good quality American turpentine oil and that it could be used in place of the latter in the manufacture of paints and varnishes. The Imperial Institute has also reported that the rosin would be quite suitable as a substitute for pine rosin (colophony) in the manufacture of varnishes, being equal in value to grade "G" of American rosin.

A lengthy paper on the treatment of cotton seed for commercial purposes was read in mail week before the Royal Society of Arts, London. A considerable part of the paper dealt with the potential value of the Indian cotton-seed crop. So far as any systematic utilisation of this crop is concerned, the author of the paper pointed out that the position now was the same as that summarised in the following statement made in 1917:— "The total area under cotton in India has been of late nearly 23,000,000 acres, and the total estimated output of cotton from this acreage is 4,500,000 bales of 400 lbs. each or about 800,000 tons of cotton. From these figures the quantity of seeds produced during the year may be roughly calculated on the basis of 30 per cent lint and 70 per cent seeds, which amounts to 1,870,000 tons. The amount of seeds required for agricultural purposes would be, at the rate of 14 lbs. per acre, about 100,000 tons, leaving about 1,750,000 tons for feeding cattle and for crushing. In 1901, when Indian seeds were first introduced into England, there were then produced in India 1,260,000 tons of seed. This huge quantity of seed was practically wasted."

The author of the paper remarks that he has gone carefully into the matter, and assuming that only 1,500,000 tons of seed per annum are potentially available in India for crushing, and that the residual fibres on such quantity are properly turned to account,

the average Indian cotton-seed crop should have a market value, under pre-war trading conditions, of certainly not less than 18 to 19 crores of rupees (£12,000,000 to, say, £12,500,000). After deduction of the costs and expenses of treatment (above 2 crores) this works out to a return of about 106 rupees (about £7) per ton of seed. So far as I have been able to gather, the average price of cotton seed up country in pre-war times did not exceed 45 rupees (about £3) per ton. Hence, the nett loss in revenue owing to the absence of a fully developed crushing industry may be put at £4 per ton of seed, or £6,000,000 per annum as a minimum figure. Doubtless, were 1,500,000 tons of cotton seed milled scientifically in India, and the products dealt with in the light of modern knowledge and experience, the actual nett loss in revenue would prove to be much higher than £6,000,000 per annum.

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A resolution on the report on the Public Instruction in Bengal for 1917 says that two-thirds of European officers of the Indian Education Service has been detached for duty in the Indian Army Reserve of Officers in addition to officers on députation to the Government of India or the University of Calcutta. The growing demand for education among the people of Bengal and natural growth of population led to an increase in the number of educational institutions. Of the scholars nearly two millions were in various stages of education, there being approximately one girl at school to every five boys. The total expenditure on education amounted to 255 lakhs. The number of arts colleges in Bengal increased to 34 or one-fourth of the total number in British India and there is a persistent demand for more. Altogether 25,265 students were reading in different colleges including one hundred and ninety-one ladies. Nearly one-third of the total number were Brahmins, while under one-tenth were Mahomedans.

There was an addition of fifty-one high and middle English Schools, while middle vernacular schools decreased by 35. The total number of boys attending primary schools was nearly 1,183,000. The number of Hindu pupils in primary schools fell by 1,000, and Mahomedans under instruction outnumber Hindus by 35,000.

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A recent Mysore Government Order states:—The stocks of food grains (in pallas) according to the census taken on the 10th December, 1918, were as follows:—

Rice	Ragi	Jolam	Navane
3,06,493	15,78,874	1,51,191	36,044

The new harvest has been estimated to yield (in pallas).

Rice	Ragi	Jolam	Navane
12,89,134	30,77,817	7,79,470	1,78,416

The total quantities (in pallas) of the several grains thus available for consumption are as follows:—

Rice	Ragi	Jolam	Navane
15,95,627	46,56,691	9,30,661	2,14,460

From the above figures it will be observed that the supply of food grains available in the State would be sufficient for only 7 or 8 months at the most and that it cannot possibly last till the next harvest. To meet the deficit, it is absolutely necessary that suitable measures should be adopted. The necessity for conserving and making economical use of the available supply of food stuffs should be brought home to the minds of the public. It is necessary to import rice and broken rice from outside to supplement the existing stock and Government have already taken action in this direction. It is also very necessary that immediate action should be taken to stimulate the cultivation of quick growing crops. The Revenue Commissioner will be good enough to submit definite proposals in consultation with the Director of Agriculture who has already taken steps in this behalf as to what further measures should be adopted towards this end.

The following table, published by the Department of Statistics, India, shows the imports of tobacco (distinguishing the various descriptions) from each principal foreign country into British India in the month of January, 1919 :—

Countries of Consignment	Unmanufactured	MANUFACTURED			Total Tobacco
		Cigars	Cigarettes	Others	
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
United Kingdom	1,785	266	375,178	63,037	440,266
Gibraltar ... ..	...	27	...	...	27
Aden and Dependencies ... ..	...	...	848	165	1,013
Ceylon	3	2	3	1	9
Straits Settlements	1,708	14	22,866	405	24,993
Australia ... ..	...	...	102	19	121
Natal ... ..	...	...	827	160	987
East African Protectorate ... ..	...	...	20	206	226
Turkey, Asiatic	34,944	874	...	...	35,818
Muskat Territory and Trucial Oman...	30	...	...	...	30
Persia	38,768	...	...	...	38,768
Philippines ... ..	...	2,754	16	...	2,770
China	26	...	...	92	118
Sumatra	27,385	...	...	...	27,385
Egypt ... ..	...	...	1,270	...	1,270
Portuguese East Africa ... ..	...	...	30	...	30
United States of America	10,235	328	37,495	52,352	100,410
Total	114,884	4,265	438,655	116,437	674,241

Duty realised on imported tobacco in January, 1919, was as follows :—

	Rs.
Tobacco, unmanufactured ...	14,181
„ manufactured—cigars and cigarettes ...	8,21,955
„ manufactured—other sorts ...	1,02,432
Total Tobacco ...	9,38,568

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To encourage the essential oils and perfumery industry in Italy the following concessions have been granted by Decree No. 1915 of 17th November 1918, published in the "Gazzetta Ufficiale" of 26th December, says the *Board of Trade Journal* :—(1) Cultivators of flowers for essential oils and perfumes are exempted from land tax for ten years, and in certain cases, from income-tax on the proceeds of such cultivation for five years. (2) Italian manufacturers of essential

oils from oils and herbs, and manufacturers of perfumes are exempted from (a) customs and octroi taxes on machinery and building materials, (b) from Income-tax for five consecutive years, and (c) from taxes and supertaxes on their building for five years.

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A Paper entitled "Cholam (*Andropogon Sorghum*) as a Substitute for Barley in Malting Operations" by B. Viswanath, T. Lakshmana Row, B.A., and P. A. Raghunathaswami Ayyangar, Dip. Ag., Assistants to the Government Agricultural Chemist, Madras, has just been published as No. 4 Vol. V. of the *Memoirs of the Department of Agriculture in India* (Chemical Series). Price As. 12. The paper deals with the investigations carried out with the object of finding a satisfactory substitute for barley from amongst the common South Indian cereals. The following obtained from the Central Farm, Coimbatore, were examined for their malting capacities: (*paddy* (*Oryza sativa*), *cholam* (*Andropogon Sorghum*), *ragi* (*Eleusine coracana*), *tenai* (*Setaria italica*), *maize* (*Zea Mays*), and *cumbu* (*Pennisetum typhoideum*). "From a consideration of the foregoing results," the authors conclude, "we feel justified in concluding that *cholam* may be used wholly or partially as a substitute for barely in malting operations. The absence of a sufficient proportion of husk in the grain is perhaps a disadvantage with *cholam*, but this defect can possibly be remedied by admixture with malted paddy or bran. *Cholam* is much cheaper and more largely available in India than barley and can, therefore, be used extensively. Foods of the types of Mellin's food, Horlick's malted milk, malt extract, and beer were prepared by us in the laboratory and submitted to the Madras Exhibition of 1917. The details of the methods of preparation and the nature of the apparatus used are being published as a separate paper. The results obtained so far may be summarized as follows:—(1) *Cholam* is better

suited for malting purposes than the other common South Indian cereals experimented with. (2) *Cholam* malt extract hydrolyses soluble starch at a greater rate than barley malt extract. (3) In the case of hydrolysis of starch by *cholam* malt the proportion of dextrine to sugar produced is greater than in the case of barley malt compared under identical conditions. (4) The products of starch hydrolysis by *cholam* malt consist, as with barley malt, largely of maltose and dextrine."

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A "Preliminary Note on the Seasoning of some Indian Timbers, by Natural Methods" by Mr. R. S. Pearson, I.F.S., F.L.S., Economist at the Forest Research Institute, Dehra Dun, has just been published as Part I of Volume VII of the *Indian Forest Records*. The author states:—"A considerable amount of information is available as to the methods of seasoning a few of the better known timbers of India, such as Teak, Sal, Deodar, etc., though little information is to hand in respect of the many valuable hardwoods, other than the above. It was therefore thought advisable to start an enquiry in 1914, with a view of ascertaining the best methods of dealing with certain important Indian hardwoods, and as a commencement 33 species were selected for testing. The results obtained have been of sufficient importance to justify an immediate extension of the enquiry on a much larger scale. At the time the experiments were initiated some doubt existed as to whether sufficiently definite results would be obtained to justify conclusions being drawn as to the correct methods of seasoning the different species of timber. In the majority of cases, however, excellent results have been obtained: a glance at the records given in Appendix IV, against such species as *Bombax malbaricum*, *Duabanga sonneratioides*, *Dillenia pentagyna*, *Diospyros Melanozylon*, *Lagerstræmia Flos-Reginae*, *Terminalia bclerica* and many others will fully support

this assertion. In the case of such timbers as *Dalbergia Sissoo* and *Dalbergia latifolia*, both timbers of excellent quality, which rarely split seriously while seasoning, the difference in results obtained by seasoning the timber in various ways is not so marked. In the case of *Bassia latifolia*, *Grewia tiliaefolia* and *Xylia xylocarpa* (Indian) very satisfactory results were not obtained, when seasoning according to the methods adopted, though some methods gave distinctly better results than others, while in the case of *Anthocephalus Cadamba* the results were negative in every instance. The results show that the number of species which should be either girdled, or the timber converted from green logs with or without subsequent immersion in water, is about equal, and that 94 per cent of the total number of species tested must be treated either according to one or other of these two methods. Natural seasoning in the log, with or without bark on, in the shade or in the open, and with or without ends treated with a coating of any protective substance, has only given beneficial results with high quality timbers, such as *Dalbergia latifolia*, *Ougeinia dalbergioides* the *Albizia* spp., etc. The experiments throughout indicate the great importance of careful stacking of timber, on level ground, with free circulation of air round each piece. Without wishing in any way to labour this point, it may be said that satisfactory results cannot be obtained without proper attention being paid to this work. It is also advisable to break the stacks and turn the timber, if left for more than three or four months in one place, this being especially necessary in damp climates. In some of the experiments, as for instance those carried out at Sukna in Kurseong and at Dandeli in the North Division, Kanara, the timber after conversion was stacked in the open, under the shade of trees, both places having a heavy rainfall. This resulted in the timber of certain species being heavily attacked by fungus and in

all cases resulted in undesirable discolouration of the timber. At Allapilli in the South Chanda Division, the timber was stored in a suitable shed, with very beneficial results, which fully justified the extra cost. Though permanent seasoning sheds, entailing a somewhat heavy initial expenditure, are no doubt justified in certain cases, it is quite feasible to erect quite temporary shelters in other cases, the cost of which will be more than repaid by the higher prices realised for the timber." The publication is priced at Re. 1 and copies can be had of the Superintendent, Government Printing, India, 8, Hastings Street, Calcutta, or from any of the agents for the sale of Government of India publications.

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Last month we published a Mysore Government order directing the grant of certain concessions for the encouragement of the cultivation of Sisal Hemp in the State. Government have now supplemented that order by another one approving the rules suggested by the Revenue Commissioner in Mysore in regard to grant of lands under the first order. These are :—

- (1) In the case of unassessed kharab lands not reserved for any special purpose and in respect of which there is no objection on the part of the villagers, the Assistant Commissioner in charge of the Taluk may grant the lands free up to a limit of 50 acres recovering only the cost of trees or other malki on the lands.
- (2) The Deputy Commissioner may similarly grant such lands up to 100 acres. In the case of assessed lands or lands set apart for special purposes, the Deputy Commissioner may at his discretion grant the lands up to 50 acres, if he is satisfied that there

is no reasonable objection to the grant.

- (3) All other cases may be sent up to the Revenue Commissioner for sanction.

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An important development in the United States silk industry, if climatic conditions are favourable, was recently announced in the press, says the *Board of Trade Journal*. So successful, it is stated, has the Austin Silk Plantation and Manufacturing Company been, that it has just increased its capital stock from 12,500 dols. to 500,000 dols., and changed its principal place of business from Austin to Houston. This company began the culture of silkworms and the production of silk near Austin about three years ago. It is stated that the company has acquired a tract of more than 300 acres of land near Houston, which it will plant in mulberry trees for the propagation of silkworms. The production of silk and its manufacture on an extensive scale is to be developed as rapidly as possible, according to the promoters of the project. It is announced that the silk farm near Austin will continue to be operated. It is not stated how much of this capital is devoted to sericulture.

A new class for the degree of M. A. in vernacular in connection with the Calcutta University will be opened on the 15th July. The study of vernacular has not hitherto found a place in the curriculum for the degree of M. A. and the innovation will be watched with great interest. The new class will prepare candidates for examination in the following twelve vernaculars:—Bengali, Hindi, Guzerati, Oriya, Assamese, Marathi, Canarese, Malayalam, Tamil, Telugu, Maitili and Urdu. The text books for the different vernaculars have already been prepared and the requisite staff of professors appointed.—P.

GLEANINGS.

A machine called the schematograph has been invented to detect defects in the human form. A description of the machine appears in *Popular Science Siftings*, which says:—“The schematograph is merely a means of registering in outline form the natural figure in various poses, all calculated to show the ordinary defects coming from faulty posture. The whole idea of the machine is to show the subject, graphically, the physical defects as indicated by his or her posture.” The device is as follows: An oblong box, about the size of a large camera, the bottoms side and ends made of wood, but the top with a sliding cover made of ground glass, a triple lens mounted in the front is an important feature of this machine. Inside the box, at the end opposite the lens, a reflecting mirror is mounted at the angle of forty-five degrees. The purpose of this mirror is to catch the rays from the image on the lens and reflect them to the ground glass over above, where they can be observed by the operator. The “operating room” is long and narrow. A black screen about seven feet high stands against the wall at one end. Some twelve feet from the screen hangs, a thick black curtain. Behind this the operator is posted, only the lens of the cammera protruding through the curtain. This arrangement serves the double purpose of shutting off all rays of light and in securing complete privacy to the subject. To make a schematogram, as the tracing is called: the subject undresses and mounts, a miniature model's throne in front of the screen. The operator focuses the machine, with the lens directed about at the subject's waistline. Just about and in front of the subject, two powerful electric lights are switched on to make the outline as clear as possible. On the ground glass at the top of the machine is clearly visible the image of the white figure, standing out against the dark screen.

If the image is satisfactory, the operator lays a thin sheet of paper over the glass and traces the outline; and if it is not, images are taken from various poses to locate the defects.

Dr. Charles Edward Nammack is an American physician with a large private practice and the supervision, when ill, of members of the police force. As all the world knows, influenza has been epidemic in U. S. A. In Dr. Nammack's opinion uncomplicated influenza does not kill unless injudicious attempts are made to relieve pain by opiate dosing, or to reduce temperature by coal-tar products. He is convinced that every death certificate which gives influenza as a cause of death is a confession of failure to find a complicating bronchopneumonia. He urges that coal-tar products are responsible for more deaths than influenza. "Influenza demands isolation, ventilation, elimination, and sustentation. Only these, and nothing more." If the patient insists on more, he orders a combination of ammonium carbonate, grs. 5, to facilitate expectoration, ammonium salicylate, grs. 5 to mitigate pain with the least depressing effect, and aromatic wine of erythroxylon coca, one-half ounce as a nerve stimulant and muscle invigorator.

The fourth meeting of the education section of the U. P. Board of Industries was held at Lucknow on 11th March, 1919. Amongst other matters which came before the Board, a proposal to open a school of Calico Printing and Dyeing at Farrukhabad, had to be postponed, owing to the unavoidable absence of Mr. Kunji Lal Sadh, who made the proposal. The question of arranging for the training of disabled soldiers was also discussed, and enquiries are being made as to the number of men belonging to these Provinces, who are desirous of obtaining training and the class of industrial work

they have a preference for. The construction of extra building for the School of Arts and crafts, Lucknow, was recommended by the Board.

In view of the unfavourable seasonal conditions prevailing in the State, the Government of Mysore desire that the touring officers of all Departments should watch the condition of the people in places visited by them and report to the Deputy Commissioner of the District and the Food Controller, any symptoms of distress that may come to their notice. In serious cases a copy of the report may be submitted direct to Government.

In the year 1890, the value of the output of pulp and paper industry in Canada was \$3,633,257; in the year 1915 this output had grown to \$40,348,021; thus in 25 years it has become 11 times greater than what it was but three decades ago. No wonder paper manufacture is going up in Canada, and there is a lesson to be learnt by us all in Mysore from these figures.

The Government of Mysore have extended the Collecting Savings Bank scheme into Mysore City and Bowringpet (including Kolar Gold Fields.)

A notification in the *Gazette of India* of the 22nd March announces the removal of the prohibition on the export of pearls from British India.

The appointment of a Chief Conservator of Forests has been sanctioned for the Madras Presidency. Mr. S. Cox, at present Conservator of Forests, Northern Circle, has been selected for this post. He will take charge of his new duties on the 1st June. His Head-quarters will be at Madras. He will assume the position at present occupied by the Board of Revenue as head of the Forest Department and will exercise all its powers and duties in that respect except such as may be reserved to Government or to any other authority.

SPEECHES AND PRONOUNCEMENTS.

THE INDUSTRIAL OUTLOOK IN ENGLAND.

Sir Albert Stanley, President of the Board of Trade, made the following speech at the annual dinner of the Huddersfield Incorporated Chamber of Commerce. He spoke in acknowledgment of a toast of "The Board of Trade." We take the report of the speech from the *Board of Trade Journal*, dated 30th February 1919:—

Sir Albert Stanley said it was almost exactly two years since he made his first and only other visit to Huddersfield. He remembered it very well indeed, because at that time it was only a few days after he had, in an almost thoughtless moment, accepted the invitation of the Prime Minister to the distinguished office he held, and at that time there was a very pressing problem engaging the attention of the Board of Trade. He found this problem as one of the legacies to which he became heir, and it was because of that problem that he came to Huddersfield. In the exuberance which a long experience of business life had taught him—for many years it had been his privilege to have a good deal of personal authority and responsibility, and to be in the fortunate position of being able to give a decision and dispose of trade problems—he referred to the problem of the development of the dyeing industry of this country as an easy problem. He had thought that it only needed discussing to arrive at a decision, and that speedy and successful action would be taken. He must confess to-day to some measure of disappointment. What he had hoped had not been yet materialised to the extent he had hoped for, but he would like to take the opportunity of conveying to Sir Joseph Turner, Mr. Norton, and Mr. Levinstein, and those associated with them in British Dyes, the thanks of the Board of Trade and his own personal thanks for what they had been able to do in advancing the interests of that most vital industry under exceedingly difficult circumstances. He was again at Huddersfield after two years, and he hoped that now they were about to see the results of their efforts during that time, and that they had now finally succeeded in establishing upon a firm and secure foundation one of the most vital industries of the country, securing its establishment

so that it would be capable of not only meeting the needs of this country, but of taking a prominent place in the open markets of the world. They (the Board of Trade and the Government) were keeping a very watchful eye upon it; they were very much interested in their trade, and he did not suppose they would be disappointed with the progress made from now onwards.

A SLOW RECOVERY.

Just as the Government were keeping a watchful eye upon the dyeing industry, so, too, were they, in this critical time, keeping a very watchful, he might say a very anxious, eye upon all the industries of the country. As they reviewed the situation to-day, they were unable to find that satisfaction with the condition of the trades of the country that one might have expected to find. It was of the first importance that they should see, in so far as it was possible, that opportunity for employment should be given to all of our men as they were returned from the Army. Yet there was the fact that, so far as they could see at the present time, the trade of this country was not making that advance which they might reasonably have expected; there was not that life and vitality in the industries that might have been expected. It made one apprehensive when one came to consider the employment of the vast number of men at present in the services. It would, perhaps, be unwise that he should unduly exaggerate this position. No doubt as good many, perhaps like himself, after the strenuous occupation of the last four-and-a-half years felt the need of a short holiday, but whatever the reasons might be, more than two months had now gone by since the armistice was signed, and he personally would be much happier if he could see stronger indications of the development of our trade upon a firm basis than he could see at present. So they must look about and ask themselves, every one of them, in the Government or out of it, what were the causes, if there were any, which were impeding the proper development of our trade.

AN EMPTY WORLD.

It would surely be agreed by everybody that there was plenty of trade in the world to be obtained. After four-and-a-half years of, in some instances, complete cessation of trade, of enormous devastations created by the war, it was no exaggeration to say that we had before us practically an empty world remaining to be re-filled. The demand was there, it would be agreed, and he thought they must look for reasons why that demand had not been met with a greater measure of enterprise. They should first look at home and see if there was anything the Government could do which they had not done, or anything they had done which should be undone.

THE REMOVAL OF CONTROLS.

First of all he might take for consideration the question of the controls—the restrictions which had been placed upon our trade during the war. It was the deliberate policy of the Government that these controls should be removed as rapidly as possible. Obviously this could not mean in every instance that they should lock the doors of these control departments and throw away the keys; that, he was sure, would be a mistaken policy. Oddly enough the experience they had during the last few weeks in their efforts to remove these controls was that they had met with almost as much opposition to their removal as they met with when they were first established. They had removed already a good many of the restrictions affecting exports, but the restrictions upon exports must be maintained with respect to those things that were vital to our existence, and we must maintain the blockade until we had secured the peace for which our gallant men had fought. That blockade involved more than the placing of a restriction upon the exports to enemy countries—it affected countries bordering upon enemy countries. So far as they could, consistent with the maintenance of the blockade, it was the intention of the Government to urge—and if possible to secure the co-operation of our Allies to that end—the restoration of the trade of those countries which were not enemy countries.

PRIORITIES AND SHIPPING.

The Board were proposing, too, that the system of priorities should be brought to a speedy end, and he was hopeful that it would be possible to arrange that no more priorities should be issued except under very special circumstances, and that the priorities now in existence should be brought to an end some time in the early part of March. As to the shipping question, there was to-day more shipping available than we had cargoes to carry, and it was expected that in the summer of this year there would be at least as much tonnage afloat as existed prior to the outbreak of war—he was referring, of course, to the world's tonnage, and not to British shipping alone. It would take a few months longer before British shipping had reached the maximum of tonnage which obtained before the war, but it was at least very satisfactory to know that, so far as shipping was concerned, traders need have no fear now of any lack of facilities for bringing goods to this country or taking them away. He thought we might look forward in the very near future to a big slump in our shipping rates. There were very few raw materials inadequate for our needs. So far as essential raw materials were concerned, there was sufficient in the world for our needs, or, alternatively, we had been able to secure the command of

a sufficient quality to meet the full demands of our manufacturers.

CONTROL OF IMPORTS.

Speaking of the restriction of imports, Sir Albert said it was within the knowledge of all that the Government found it necessary during the war, either because there was insufficient tonnage, or for reasons of exchange, to impose severe restrictions upon a large proportion of the imports brought to this country. The time had come to consider the relaxation of these restrictions and it had been suggested by various interests that they should retain for a time their control. The reason advanced was that owing to the demands which the Government had made upon manufacturers, and to the enormous changes which had taken place, the Government should for a time keep a restraining hand upon the flow of imports until our manufacturers had had an opportunity to re-establish themselves on a peace footing. He thought that was a fair proposition, and one that should have the acceptance of the Government. At the same time they all desired to continue on the same closed and friendly relations with our Allies. Friendly rivalry there must be, but there was plenty of room in the world for everybody, and by close co-operation, good understanding, and a friendly spirit we should secure the peace of the world better than in any other way. As to the subject of excess profits, he was sure they would all sympathise with the task that would fall upon Mr. Austen Chamberlain, and he hoped some way would be found whereby the demands of the Treasury might be met without imposing any undue taxes upon the country's industries.

A MINISTRY OF COMMERCE.

As to the equipment of a new Ministry of Commerce, he believed this was about to be realised. The Board of Trade was a huge department. It has too many activities and responsibilities to do them all well. Some of them were going to be taken away and the Board of Trade would become a new department, to which leaders of our great industries might come and find a staff competent to deal with the questions brought forward. It would not be the function of this department to control or interfere with trade interests, but representatives of trade and commerce would be able to come to it with their problems for advice. He trusted that those who sought its advice would come representing the views of a whole industry and not a part of one, as often happened in the past. Into this new department they proposed to bring men from outside of wide experience, competent to advise on trade matters.

THE PROBLEMS BEFORE US.

The problems before the country were not easy. We had got facing us competition more intense than any experienced in years past. We had facing us also the question of higher wages and better conditions of employments, and on top of that the enormous burden of debt arising out of the war. How were these problems to be met? Obviously there was but one answer, and that was by increased production and low costs of production. He thought it would be agreed that there was a willingness on part of employers to give the best possible wages and afford the best conditions of employment. He was satisfied himself that good wages and reasonable hours of employment were a good business proposition provided that in return the workmen gave a fair day's work.

It was very disturbing that at this time we should find such a spirit of unrest throughout the country. There appeared to be a feeling among working people and among some of their leaders that the only way of advancing their interests was by going on strike,

LABOUR UNREST.

"I cannot myself," said Sir Albert Stanley, "conceive anything more disturbing to the proper development of our trade and industries than to have these constant outbreaks. One is often asked why it so often happens that the settlement of a labour dispute only comes after a strike has taken place. Again, this may be one of the problems arising out of the war. I must confess there have been instances when it seems very difficult to find a reason why things are allowed to go to a final issue, and men are out before a settlement is reached. I am not pretending to judge the merits of any dispute; there may be reason in them, or otherwise. I am only suggesting that this method of securing the redress of any alleged grievance is not in the best interests of the men or of the trade country, and some way must be found sooner or later whereby these great questions affecting labour may be settled without resort to a strike."

Concluding, Sir Albert mentioned that one of the first matters to be dealt with in the new Parliament would be to stop "dumping" in this country, and said he could not understand why it had been allowed so many years.

INDUSTRIAL PROGRESS IN THE UNITED PROVINCE.

Government Resolution.

The following Resolution of the United Provinces Government on the Report of the Director of Industries, United Provinces, for 1917-18 is taken from the *United Provinces Gazette* of March 1, 1919:—

The position which has been reached in the development of the industries of the Province is in some respects similar to the position now confronting the Forest Department. During the last few years there have been difficulties arising out of shortage of transport and restricted imports of machinery but, on the whole, industries generally, have benefited considerably by war conditions which have assisted a policy of expansion. High prices and the demands of the Army department have applied an effective stimulus to production, but when the stimulus is removed, a special effort will be necessary to prevent decline. The position is fully realized by the leading industrialists of the province and every endeavour is being made to cope with the new situation. Mr. O'Malley's report indicates that while the industries of the province are still only in their infancy and many have yet to be established, sound foundations are being laid. The report also demonstrates that it is essential that, for some time to come, a considerable number of European experts should be engaged for the training of indigenous labour of different grades. The demobilisation of the territorial regiments now in India offers an excellent opportunity for securing the services of skilled industrial artisans and teachers in that trades that are most promising and efforts are being made by the Local Government to utilise the occasion.

The present position generally may be illustrated by the leather industry. During the war large extensions have been carried out in the existing factories in Cawnpore and some new tanneries have been started. The Local Government has furnished help where necessary in securing suitable sites and in other ways. The Director points out that the leather industry in this province has immense possibilities before it, but, at the same time, he recognises that the developments which have taken place have been stimulated by the demands of the Army and he is doubtful whether, when conditions again become normal, the business will continue on its present scale. There is, it is true, a large supply

of hides and skins in the province, but we have no tanning agent of equal value to *cassia auriculata*, and the supply of *babul* bark is also limited specially in the neighbourhood of Cawnpore. The Local Government is fully sensible of the great advantages to be secured by an extensive cultivation of *cassia auriculata* and experiments have been conducted for several years past. It has not yet been proved that the plant can be grown with profit on a commercial basis in the soil of this province, but His Honour has directed a continuance of the trial on an extended scale.

The Local Government has also taken steps for the growing of *babul* trees on canal banks. The various minor tanning materials in the forests of the province are receiving attention. The Lieutenant-Governor will be ready to consider suitable proposals for the commercial utilisation of such products. One such factory is already at work in the Naini Tal district. Sir Harcourt Butler thinks that one solution of the existing shortage of tanning materials in Cawnpore may possibly be found in the establishment of factories in parts of the province whence it is too expensive at present to transport the raw material to Cawnpore. The Director of Industries has advocated the establishment of a tanning school. His Honour desires that the Board of Industries should make proposal for such a school, should the idea commend itself to them. Any considered scheme that may be submitted by the Board of Industries will receive the careful attention of the Local Government.

The war gave a very considerable impetus to the cotton and wool industries of the province which are at present more or less concentrated in Cawnpore. The mill-owners took full advantage of the considerably increased demand. The Lieutenant-Governor hopes that the enhanced outturn of these mills will be maintained in peace times, to the great benefit of the consuming classes of the province as also of the workmen employed in these mills. The cotton industry has had to contend with very short crops during the last two years and prices have consequently been inflated.

With the return of normal agricultural conditions this difficulty will, it is hoped, disappear. There is only a limited supply of wool of a suitable quality in the province. Experiments in growing sheep of a better quality for the purposes of wool-production have been made in past years and the Local Government will be ready to consider any suitable proposals for further efforts in this direction. An industry which has come into prominence during the war is the manufacture of brush-ware. There is a fair supply of raw materials in the province and probably its quality can be improved by a sustained effort.

His Honour hopes that this industry will receive the attention that it deserves.

Another industry which is being accepted by capitalists as affording one of the most promising fields for development is that of oil-pressing. This industry appears to have suffered more than it has gained by war conditions. Owing to import restrictions it has not been possible to purchase any modern oil-pressing plant from abroad and no new mills therefore have been established during the war. It is recognised that the methods used at present are wasteful and results from the inefficient machinery used are unsatisfactory. Capitalists are said to be waiting to put up modern oil mills as soon as conditions for the purchase of plant are favourable. The Director of Industries recommends the appointment of an oil expert to systematise the industry on modern lines. The Local Government will await the views of the Board of Industries. Linked up with the oil industry is the manufacture of varnishes, oil-paints and lubricants. Here, again, there is an ample field for development. It is noted in the report that factories for the manufacture of paints and varnishes have been established in other provinces. The Director of Industries will no doubt take steps for the encouragement of similar enterprise in this province.

The local manufacture of glass-ware has made rapid strides during the war, and a number of new glass-works have sprung up. Improvements have been introduced at the Allahabad glass-works which is the largest concern in the province, and useful glass-ware has been turned out there for military purposes. The work at Bijohi have been financed to a certain extent by Government which has enabled them to make good progress. Mr. Elland, the glass expert who was brought out from England by this Government at the commencement of the war, is about to return home on the termination of his engagement. His services have been of great value in the development that has taken place in the provincial industry. Endeavours are being made to obtain another expert from the territorial regiments. It is also understood that the Government of India contemplate the appointment of a specialist in glass with superior scientific qualifications whose services will be available for the whole of India. The shortage of skilled blowers in the province is rapidly disappearing as a consequence of the training imported at the different works. The Indian Munitions Board have very kindly helped in this direction by the loan of men from the territorial regiments to the Allahabad glass-works. The Director of Industries has appended to his report a statement showing the continued increase in the import of glass-ware during the last

three years—a remarkable fact when restrictions on imports and high prices are considered. The special attention of the factories has been drawn to the steady growth of imports in beads and false pearls which the poorer classes generally use for ornaments and jewellery. The bangle-making industry of Firozbad is doing well and the bangles turned out have greatly improved, but the output is quite sufficient to meet the demand and the import of Japanese bangles has steadily increased.

Difficulties of procuring plant have naturally prevented the establishment of new industries upon a large scale and the shortage of railway wagons and coal has also hindered progress. There is little to notice in consequence as regards metal-ware. The metal-pressing plant that was imported by the Local Government has been lent to a private firm. Endeavours are being made to secure the services of die-sinker for the province. The position of the match industry is also disappointing. The prices of chemicals still continue to be prohibitive. The management of the Bareilly factory, however, hope to recommence operations very shortly. The Local Government will be willing to consider any reasonable applications for facilities with regard to suitable timber for manufacturing purposes.

The Industrial Chemist, Mr. Srivatsava, has compiled a detailed report of the various activities of the Technical Laboratory attached to the office of the Director of Industries and though there is naturally much in it which only appeals to the expert, it is by no means devoid of interest for the layman. Experimental work as regards dyes and chemicals required in the dyeing, tanning and other industries has met with a considerable amount of success. The work has been of value to several industries dependent on a supply of chemicals which were formerly imported.

The laboratory has also been engaged for the last two years on experiments regarding the manufacture of essential oils and valuable data have been obtained commercial possibilities have not yet been worked out, but it may be noted that a new firm have started a factory in Cawnpore with an up-to-date plant for the manufacture of essential oils and allied products. In pursuance of a recommendation of the Board of Industries, the Local Government is placing the Director in funds for sustained experiments on a comparatively large scale with the oils and perfumes that are now manufactured in the province or for which an adequate supply of raw materials is locally available.

The Government Experimental Soda Factory at Cawnpore, which was also under the charge of Mr. Srivatsava, was started with a view to

manufacture sodium carbonate and caustic soda from reh. The experiment was novel and was conducted with much ingenuity and resource. Local capitalists have readily availed themselves of the methods demonstrated at the Government factory and as private factories are now springing into existence, a long lease of the Government factory is being given to a private firm.

Mr. O'Malley's report does not embrace the industries that are closely allied with the operations of the two departments of Agriculture and Forests, for example, the manufacture of sugar or of timber products. There has been much activity in some branches of these industries and the Lieutenant-Governor has already expressed his views with regard to the development of these industries in the recent views of the report of the Director of Agriculture and the Chief Conservator of Forests. The smaller art industries of the province have naturally suffered during a period of high prices and restrictions on exports. They are, however, receiving attention and it is hoped that with normal conditions many of them will again attain prosperity. The Emporium at Cawnpore, which was established with Government assistance with the object of bringing the actual producer in touch with the consumer, has had various difficulties to contend with and proposals are now under consideration for its re-organization on new lines. A special enquiry has been made into the position and prospects of the gold thread industry of Benares and the Local Government has recently sanctioned a grant for the improvement of this industry. The School of Arts and Crafts in Lucknow, which hitherto had been considered in the nature of an experiment, has now been made a permanent institution. The Lieutenant-Governor hopes that it will turn out pupils who will combine business aptitude with improved design and execution and will thus be the means of giving new life to the numerous art industries of the province. High prices of mill-made cloth and the restriction of imports from Lancashire might have provided a good opportunity for the revival of hand-loom weaving in the province, but for the limited supply of yarn which was a result of the short cotton crops in the country. The Central Weaving Institute at Benares is now rapidly getting into touch with the weaving community in different parts of the province, partly through the agency of the stores attached to it for the sale of yarn and partly through the peripatetic weaving schools. A new departure which Sir Harcourt Butler welcomes has been the experimental manufacture of various accessories for weaving which used to be formerly imported. His Honour hopes that efforts in this direction will be

persevered with. The smaller weaving schools have had varied success and evidently much depends on the interest taken by local workers. The Lieutenant-Governor thinks that in addition to the instruction given in the schools it is essential that the weavers should be assisted with advances for the purchase of looms and accessories and, if possible, co-operative organizations should step in for the purchase of raw materials and the sale of the produce of the looms. There has been some extension in the number of hosiery and blanket-weaving classes although the former have been handicapped by the difficulties experienced in obtaining knitting machines and needles. The hosiery industry has a vast field before it and His Honour is glad to observe that it is gradually establishing itself as a home industry among the lower middle classes of the province.

With regard to the extension of industrial and technical education the year has been one more of preparation than of actual achievement. The existing institutions have made considerable progress. A reference has already been made to the Central Weaving Institute and the smaller weaving and hosiery schools. The School of Arts and Crafts has been re-organized and made permanent. The School of Needle-work at Lucknow has also been placed on improved lines and it is hoped will meet a distinct want. The Central Wood Working Institute at Bareilly has since the close of the year been transferred to the control of the Forest Department in order that in addition to its educational work it may also be utilised for the purposes of testing the use of the various miscellaneous products of the forests of the province on a semi-commercial scale. The Lieutenant-Governor believes that there is great scope for the organization of a large industry in future and cabinet-making throughout the province and he has since the close of the year sanctioned the establishment on an experimental basis of a carpentry school at Allahabad. He hopes that it will soon develop into a useful institution. The technical schools at Gorakhpur and Lucknow have had a successful year under Messrs. Swinchartt and Lyons. His Honour is specially gratified to observe that the passed pupils of these two schools have no difficulty in obtaining suitable employment. A scheme for the establishment of another technical school at Jhansi has also been sanctioned and His Honour trusts that with the co-operation which has been generously promised by the G. I. P. Railway the school will soon start work and prove a distinct success. In Cawnpore, both the school of dyeing and the school for leather workers have attracted a good class of pupils and are providing useful instruction. The Local

Government has also determined to establish in the very near future a school in Cawnpore for workers in the textile mills and a school for electric wiremen. For the location of the various industrial schools at Cawnpore, a suitable site is being acquired. In this connection the Lieutenant-Governor wishes to acknowledge the cordial co-operation that the Local Government has received from the Upper India Chamber of Commerce in devising schemes for the industrial education of the working population of Cawnpore.

His Honour hopes to see during his term of office a considerable expansion of vocational instruction in the province. He is glad to observe that the lines on which the provincial programme of industrial and technical education is based are in harmony with the recommendations made by the Industrial Commission in this respect. War conditions stood in the way of a start being made with the proposed Technological Institute at Cawnpore. Sir Harcourt Butler is anxious that work in the Institute should begin as soon as possible and he is already taking steps for the appointment of a competent Principal in order that a beginning may be made at once.

In the matter of industrial development and technical education the Lieutenant-Governor is anxious that the activities of the State should receive full co-operation and constant advice from the commercial and industrial communities of the province. With this view the Board of Industries has been re-organized and divided for detailed work into two sections. His Honour is gratified to note that the re-constituted Board has already displayed considerable initiative and is taking a keen interest in the economical progress of the province.

Sir Harcourt Butler is indebted to the Board of Industries for much valuable assistance.

Mr. O'Malley has officiated as Director of Industries since the deputation of Mr. A. H. Silver, C.I.E., to the Indian Munitions Board in June, 1917. The War has thrown on the Director of Industries a great deal of additional work which has, to a certain extent, hampered his ordinary duties. Sir Harcourt Butler desires to acknowledge the tact and industry which Mr. O'Malley has displayed in his work and wishes to thank him for a full report.

His Honour hopes that the report will be submitted more punctually in future, as in industrial and commercial matters specially it is important that the results of the year's work should be reviewed without any unnecessary delay.

LABOUR SUPPLY IN THE MALNAD.

The following Mysore Government Order No. G. 20308-13—San. 80-16-15, dated 10th March 1919 has been issued :—

Since the introduction of the Malnad Improvement Scheme which had the effect of setting the people in that area to think about the amelioration of their condition, the question of the supply of labour to the areca-nut garden owners has been frequently urged for the consideration of Government. Much valuable thought has been bestowed on the subject, both by individual members of the Malnad Improvement Committees and by the Committees themselves as the result of which several scheme have been submitted for the consideration of Government, with a view to secure Government assistance and co-operation, while not taking state finance to any great extent. Government appreciate the earnestness with which the details of a scheme of this kind have been threshed out. After having carefully considered the subject in its several aspects, they desire to point out that the question of labour supply is essentially a social and economic problem, the success or failure of which depends upon the amount of co-operation there is among the land-owners themselves, and their capacity to organize for a common purpose on definite principles. This question affecting, as it does, the interests of both employers as well as labourers, besides being intimately connected with the question of wages and the conditions of employment is, however, pre-eminently one for private initiative assisted, if and when necessary, by Government in matters, relating to superintendence and advice.

2. It has been repeatedly urged, however, that in the present state of the malnad, initiative in a matter of this kind cannot be expected and that in order to infuse confidence into the minds of both the employer and the cooly, and to check the evil influences of the uncontrolled Kangani, the interference of Government in the earlier stages of the scheme is necessary. Government agree that there is need for an organization of this kind and that a start may be made to induce the garden owners to combine for the economic development of their gardens, which form a valuable asset of the State. Government are accordingly pleased to direct that an experiment be made in this direction in respect of the taluks of Koppa and Tirthahally in the manner and subject to the conditions set forth hereunder.

3. Before the establishment of a Labour Bureau on the lines recommended the Shimoga District

Committee, the Chairman of the Committee is requested to make a preliminary investigation into the following matters and to submit a report to Government within three months.

- (1) Whether three-fourths of the number of labour employing garden owners in the taluks, referred to, agree, in writing, to act through this department only, becoming members thereof, and subject to such rules and conditions as may be prescribed by the department in respect of wages, manner of employment, hours of labour, etc.
- (2) Whether the land-owners will be prepared to contribute a moiety of the cost of the scheme, by raising a suitable acreage cess.

Whether the employers of labour will provide for adequate sanitary arrangements for housing the labourers, etc.

4. On these conditions being satisfied, a labour recruiting agency will be stationed at Udipi as recommended by the Shimoga District Committee establishment for dealing with the following matters :—

1 Labour correspondent	Rs. 200 plus		
local allowance	Rs. 50 plus fixed		
travelling allowance	Rs. 50	...	300
1 Clerk	...	...	40
1 Clerk	...	...	15
1 Peon	...	...	8
3 Labour agents on	Rs. 35 each with fixed		
travelling allowance of	Rs. 10 each...		135
Contingencies	...	...	50
<hr/>			
Total per mensem	...		548
Cost per annum	...		6,776

N.B.—Maistries to be entertained on a monthly pay not exceeding Rs. 10 a month to be supplemented by payment of commission at 2 or 3 per cent on the amount paid to the coolies supplied to each owner.

- (1) Obtain information as to where, when, what kind of labour and to what extent labour will be available within any specified labour supplying area.
- (2) Ascertain the extent to which and the period during which labour will be required in the taluks taken up for consideration.
- (3) Arrange for the preparation of a list of reliable Kanganies or cooly maistries.

- (4) Suggest arrangements for regulating the payments to be made by employers either in the shape of wages or in the shape of advances.
- (5) Supervise cooly interests and prevent desertion.
- (6) Undertake as far as possible, the steady supply of labour at short notice. The attention of the District Committee is invited to the fact that the weak point of the whole problem seems to lie in the fact that the recruiting Kanganis is ordinarily an irresponsible person who tries to fleece the cooly and to exploit the employer, and the chief effort of the scheme should therefore be to minimise the Kanganis' evil influence, by proper control. The appointment of paid maistries will, it is hoped, secure the above object and if a liberal commission is arranged to be paid to the maistry on the results of his work, the danger of his falling into a state of paid inactivity may be avoided.

5. The Labour Agency will be under the control of the Shimoga District Committee, assisted by an Advisory Board of ten members elected from among the land-owners, who are members of the department.

6. The scheme will be temporary for a period of two years and a moiety of the total cost in each will be met out of the Supari Cess Fund, the other half being contributed by the labour employing land-owners, calculated on the basis of the acreage under each member's holding.

7. The Chairman, Malnad Improvement Committee, Shimoga, is also requested to submit draft rules for the working of the Bureau, together with the accounts, reports and forms that may be prescribed for the Bureau, for the approval and order of Government.

TOPICS FROM ECONOMIC PERIODICALS.

THE COCONUT INDUSTRIES.

We take the following from the *Board of Trade Journal* :—

The coconut estates of Trinidad, confined within comparatively small portions of the island by the sea coast, are yielding greater profits on the capital invested in them than any other agricultural industry in the island. With constant planting of new trees, the industry, it is considered, is bound to expand in importance during the next few years.

During the year 1917, the export of coconuts from Trinidad amounted to 16,595, 282 coconuts locally grown, and also 760,430 foreign coconuts, chiefly Venezuelan. Most of these were shipped to the United States, the figures being 13,867,655 coconuts valued at 398,912 dols., and 696,100 Venezuelan coconuts, valued at 22,806 dols.

The export of copra in 1917, according to the United States "Commerce Reports," amounted to 7,201,448 lb., of which 3,277,258 lb. were exported to the United States. All the copra exported from Trinidad during that year was produced locally.

PRODUCTION OF COCONUT OIL.

Trinidad produces approximately 140,000 gallons of coconut oil a year for the consumption of the local population, especially the East Indian coolie classes, who use it both as a food and as a lotion for their bodies. The amount of coconut oil produced depends to some extent on the relative price of copra, for when the export price of copra offers more profit than the manufacture of the same into coconut oil, the owners prefer to sell copra for export. Large exports of copra, which would seriously curtail coconut oil production, would never be permitted, as the local government would impose embargoes to keep, sufficient copra in the country. It was to prevent the threatened curtailment in the output of coconut oil, as well as to increase the Revenue, that the export duties on nuts and copra were increased in May 1917.

PRODUCTIVE LOCALITIES IN TRINIDAD.

Coconut trees are to be found practically all round the coast, but the production is concentrated chiefly in two districts—one, the Cedros district, has about 9,640 acres, 7,000 of which are bearing, and the other, the Mayaro district, has 7,500 acres in trees, all bearing coconuts. The island of Trinidad altogether has about 27,000 acres in coconuts,

one-third of which is probably not yet bearing. The island of Tobago has now about 9,000 acres, but only a very small proportion of trees are bearing.

There are about 21,000,000 coconuts produced annually in the Cedros district, of which approximately 16,000,000 are grown on large estates owned by English companies or planters of French and English extraction, and about 5,000,000 on small estates owned chiefly by East Indians and negroes. The cost of working these small estates is considerably more per acre than that of large estates. Large estates vary from 800 to 1,600 acres, and small estates from 10 to 100 acres.

Next in importance to the Cedros district is that of Mayaro, which covers about seventeen miles of the southern part of the east coast of Trinidad, with an extent inland of about a quarter of a mile. Some 12,000,000 coconuts are produced annually in this district, but the nuts are smaller than those produced in the Cedros district. The soil conditions are less favourable, and only about 20 per cent of all the coconuts produced are within the two classes desired for important into the United States as nuts. The remaining 80 per cent is used for copra and coconut oil, the shells serving as fuel for the manufacture.

OIL FACTORIES IN MAYARO.

In the Mayaro district there are three factories, each of which makes use of 7,000 coconuts per day for the manufacture of oil. The total output amounts to about 100,000 gallons per year, and about 500,000 lb. of coconut cake, sold mostly in Trinidad for feeding stock. Probably about one-half of all the coconuts produced in this district find their way into these three factories for making oil, but this depends on the relative price of copra.

MACHINERY IN USE—CAMELS' HAIR BAGGING.

At one of the coconut oil factories the machinery used consists of two shredding machines, one of Scotch and one of German manufacture, which grind the copra by tearing and cutting it into small pieces; several edge-runner mills which grind without concussion, thus preventing premature expression of oil; three presses of German manufacture, having 3 tons pressure to the square inch; and German hydraulic pumps. The press cylinders are made of cast steel and have pistons which press up against the pans holding the copra.

The greatest difficulty at present in connection with extraction of coconut oil is that of obtaining camels' hair press bags. Before the war these were imported from Germany at a cost of 10d. per lb. They are now imported from New York, but cost 4s. 2d. per lb., and are said to last only one-sixth the time of those formerly used. A bale of this bagging now lasts only about four months, it is said,

and is difficult to import at all, but the German bagging of equivalent measure imported before the war would last about two years.

An analysis of coconut products was made at a factory in Port of Spain, the nuts having been delivered whole to the factory for this purpose, although usually only copra is brought there. This analysis revealed that 1,000 selected nuts, weighing 1491 lb. in the shell, yielded 735 lb. of green copra, 446 lb. of shell, and 310 lb. of water; the green copra yielded 440 lb. of dry copra. The same number of culls, weighing 1,043 lb. in the shell, yielded 326 lb. of shell, 189 lb. of water, and 528 lb. of green copra, or 318 lb. of dry copra. The 2,000 coconuts yielded 45 gallons (imperial) of coconut oil, averaging 6 gallons per 100 lb. of copra, and 290 lb. of coconut meal. The factory ordinarily uses 20,000 lb. of copra every week, making 1,200 gallons of oil and 10,000 lb. of meal. Besides coconut shells, wood and coal, a good deal of saw-dust obtained from a saw-mill in the vicinity has been used for fuel.

COIR FIBRE.

In addition to copra and coconut oil, the coir fibre of the coconuts is also a source of revenue in connection with the coconut industry of Trinidad, notwithstanding the fact that a vast amount of this fibre is wasted on husks thrown away or used only for fuel. At the gaol in Port of Spain, prisoners have an industry of making mats from coconut fibre, these being used for household purposes, for motor cars, etc. In Port of Spain there is also the West Indian fibre factory, employing about 50 persons, including 16 machine men, with an average output of between 6 and 7 tons of fibre per week.

At this factory the crude material of coconut husk is purchased locally, and the fibre finds a ready market in Europe, Venezuela, British Guiana, and other places. Sixteen machines standing in regular alignment perform the task of extracting the fibre, the motive power being supplied by an 85 horse power semi-Diesel two-cylinder engine imported from Manchester.

In addition to the coir-fibre factory at Port of Spain already mentioned, there is another plant existing for such purpose on the Cedros Peninsula, which, with four machines, can use the fibre from about 2,000 coconut husks per day. It is temporarily closed on account of the difficulty of shipping the fibre.

There is the utmost feeling of confidence in Trinidad in the future of the coconut industry, and it is believed that there will always be an active world-demand for coconut products, especially Copra in connection with the increasing use of

margarine. Many of the sugar planters in Trinidad, who fear that present very high prices, will not continue, are planting coconuts as a safeguard of future prosperity. Many coco planters also, when they have suitable land, are planting coconuts, as it is believed that there is more prospect of stability in view of the coco market being more limited and of the great increasing competition from the new coco lands of Nigeria.

TREATMENT OF COTTON SEED FOR COMMERCIAL PURPOSES.

The full text of the paper on "The removal of the residual fibres from cotton seed and their value for non-textile purposes" by Mr. Ed. C. de Segundo, A. M. Inst. C. E., Inst. Mech. E., M. I. E. E., read before the Royal Society of Arts, with the discussion that followed, is published in the Society's *Journal* of 14th February, 1919. A considerable part of the paper deals with the potential value of the Indian cotton seed crop. The following are extracts from the paper:—

The quantity of short cotton fibre left upon Indian cotton seed after ginning seems to vary considerably. One authority puts it at from 8 per cent to 12 per cent of the total weight of the ginned seed. Another estimates it at about $3\frac{1}{2}$ per cent. The only Indian seed used hitherto in the crushing industry in Great Britain is known in British markets as "Bombay" seed, which does not retain more than 2 per cent of short lint calculated on the total weight of the seed.

During the past few years the cultivation in India of the American variety of cotton has been considerably extended. According to the Indian Government returns, about 400,000 bales (of 500 pounds) of Cambodia seed were grown in 1917 corresponding to the production of about 250,000 to 270,000 tons of seed. Cambodia seed resembles the American Upland closely, and the seed may therefore be taken to retain after ginning from 10 per cent to 12 per cent of its total weight of short lint.

In the spring of 1917, Sir A. D. Steel-Maitland (then Under-Secretary of State for the Colonies) delivered an address at the London School of Economics and Political Science on "Oils and

Fats in the British Empire," in the course of which he stated that "the local production of cotton seed in India is very large, reaching 2,000,000 tons per annum. The quantity exported, chiefly to the United Kingdom, varies from 100,000 to 400,000 tons, a slight difference in price in being sufficient to bring forward largely increased quantities."

This estimate is corroborated by Professor Dunstan, who put the Indian cotton-seed crop in 1913-14 at 2,120,000 tons (*Bulletin* of the Imperial Institute, July-September, 1917.)

So far as any systematic utilization of the Indian cotton-seed crop is concerned, the present situation is well summed up in an interesting and instructive paper read before the Manchester section of the Society of Chemical Industry in May, 1917, by Mr. Kapilram H. Vakil, chief consulting chemist to Messrs. Tata Sons, Limited, of Bombay. He says; "The total area under cotton in India has been of late nearly 23,000,000 acres, and the total estimated output of cotton from this acreage is 4,500,000 bales of 400 lb, each, or about 800,000 tons of cotton. From these figures the quantity of seeds produced during the year may be roughly calculated on the basis of 30 per cent lint and 70 per cent seeds which amounts to 1,870,000 tons. The amount of seed required for agricultural purposes would be at the rate of 14 lb. per acre, about 100,000 tons, leaving about 1,750,000 tons for feeding cattle and for crushing. In 1901, when Indian seeds were first introduced into England, there were then produced in India 1,260,000 tons of seed. This huge quantity of seed was practically wasted."

Now, Mr. Vakil presumably used the word "wasted" in the sense of "not turned to account in a manner representative of proved commercial possibilities." In this sense Mr. Vakil is right. Even to-day, owing to the fact that the cotton-seed oil industry in India has not been developed on modern lines to any appreciable extent, large quantities of cotton seed have been fed direct to cattle in India, which, undoubtedly, is about as "wasteful" a proceeding, from the point of view of national economics, as could be imagined.

In a Consular report issued by the United States Government (Department of Commerce) on November 4th, 1918, the following reference is made to cotton-seed crushing in India:—

"India is in the same condition as was the United States forty years ago as regards the scientific utilization of cotton-seed. Except for some 250,000 tons exported to England, and for the quantity needed for sowing, the cotton seed is practically all used for

fodder, at an enormous economic waste of edible oil. There was but one oil-mill in India in 1915. The annual loss due to lack of a modern crushing industry in India has been estimated at Rs. 315,000,000."

This estimate seems to me to be rather a high one. Possibly it is based upon present-day prices for cotton-seed oil and cake, which, of course, cannot be expected to maintain their present level. I have gone carefully into the matter and, assuming that only 1,500,000 tons of seed per annum are potentially available in India for crushing, and that the residual fibres on such quantity are properly turned to account, the average Indian cotton-seed crop should have a market value, under pre-war trading conditions, of certainly not less than 18 to 19 crores rupees (£12,000,000 to say, £12,500,000). After deduction of the costs and expenses of treatment (about 2 crores) this works out to a return of about 106 rupees (about £7) per ton of seed. So far as I have been able to gather, the average price of cotton-seed up country in pre-war times did not exceed 45 rupees (about £5) per ton. Hence, the *nett* loss in revenue owing to the absence of a fully developed crushing industry may be put at £4 per ton of seed, or £6,000,000 per annum as a minimum figure. Doubtless, were 1,500,000 tons of cotton-seed milled scientifically in India, and the products dealt with in the light of modern knowledge and experience, the *actual* nett loss in revenue would prove to be much higher than £6,000,000 per annum.

Let us now examine into the advantage to be gained by defibrating Indian seed dettined for export. We will consider two varieties, Bombay seed and Cambodia seed, which may, respectively, be taken to be representative of the least woolly and the most woolly of the Indian varieties. Bombay seed retains only about 1½ per cent of merchantable fibre worth recovering; but measurements show that after the removal of this quantity of fibre the seed bulks appreciably more closely, that is to say, a given volume will contain from 12½ per cent to 15 per cent more defibrated seed than undefibrated. Assuming that the defibration were carried out at the ginnery—as, of course, it ought to be—and that 5 per cent of dirt and other foreign matter is also removed in the process of defibration, a railway truck of cleaned defibrated seed would carry about 15 per cent more seed, and some advantage in freight charges would be obtainable on this account. The shipment sack now used would contain some 15 per cent more seed, and as freight is paid per ton measurement—but the seed is sold in British markets per ton weight—the shipper would save some 3s. in

the £ in ocean freight, and also something on the sacks. Produce brokers who have inspected samples of Bombay seed, cleaned and defibrated by this seed-defibrating machine, have stated that such seed would command a premium of 15s. per ton in British markets above prices ruling (in pre-war days) for Bombay seed as now shipped. Under conditions ruling to-day the premium would be much higher.

Cambodia seed may fairly be assumed to be on a par with American Upland, and may thus be taken to retain, say, 11 per cent of its total weight of short lint after ginning.

This seed would probably contain the same amount of dirt and foreign matter as Bombay seed, say 5 per cent. Possibly 2 per cent of its weight in "linters" would be recoverable by saw-linting machinery, and a further 7 per cent of "seed-lint" in the seed-defibrating machine. This would leave about 2 per cent of its weight of very short lint on the seed shipped, which is about the quantity found upon Egyptian (a bald) seed, and is useful in binding together the cake made and preventing it from becoming friable.

Measurements made of Uganda seed (which is similar to Cambodia) before and after defibration show that a given volume will contain about 20 per cent more weight of defibrated seed, and London cotton-seed brokers who have inspected samples of this seed after defibration state that it would command a price within, say, 5s. or 10s. of Egyptian seed, provided, of course, that there was an equivalent in oil. From analyses which have been furnished to me by Messrs. Cloyton, Beadle and Stevens, it would appear that the percentage of oil in cleaned defibrated Uganda seed should be well up to that in Egyptian seed. The average difference in price between Uganda and Egyptian in pre-war times may be taken on the average to have been about £2, so that cleaned defibrated Uganda seed should command a premium of about 30s. per ton over the price of such seed as shipped heretofore.

*The table below indicates the additional return which should be obtained by defibrating these two varieties of Indian seed, viz, Bombay and Cambodia, prior to shipment from India to British ports. As a measure of prudence, the premium on defibrated Bombay seed is taken at 12s., and that on defibrated Uganda (or similar seed, such as Cambodia) at 25s. per ton,

						Bombay seed 100 tons (say 2 per cent residual fibre)	Cambodia seed 100 tons (say 11 per cent residual fibre)
						per cent tons	per cent tons
Dirt	...	...	...	...	...	5 5	5 5
Linters	...	...	...	...	...	... ...	2 2
Seed-lint	...	...	...	...	...	1½ 1½	7 7
						6½	14
Weight shipped	...	...	...	...	...	93½	86
						100	100
Premium on defibrated seed in British markets	...	...	...	...	...	Say 12s.	Say 25s.
Value as now shipped (undefibrated)	...	...	...	...	...	£5 per ton	£7 per ton
Value realised for quantity shipped	...	...	...	...	...	£5 12s. per ton £ 523	£8 5s. per ton £ 709
Add net profits on sale of linters	...	...	...	...	...	...	25
Add net profit on sale of seed-lint	...	...	...	...	...	11	49
Add saving on freight owing to closer bulking (taken at 12½ per cent for Bombay and 20 per cent for Uganda), and saving of £1 per ton of dirt and seed-lint.	...	...	...	...	...	Say 19	Say 34
Total						£553	£817
Value of seed as now shipped	...	...	...	...	...	£5 per ton 500	700
Net additional return	...	...	...	...	...	53	117
Net additional return per ton original weight of seed (100 tons).	...	...	...	...	...	10s. 6d.	£1 3s.

(NOTE.—Figures throughout refer pre-war to trading conditions.)

If the percentage of dirt in the seed should be less than that assumed (5 per cent of the total weight of the seed) the additional return per ton original weight of seed would be increased. It will, of course, be understood that the figures above are *exempli gratia*. In practice, the additional return may prove larger or smaller according to circumstances, but in any case it should be substantial.

These figures, it is perhaps needless to point out, must not be taken to indicate that a given quantity of seed could be made to produce proportionate results anywhere in India. No doubt in some localities cotton seed will continue to be fed direct

to cattle because local conditions may militate against its being dealt with profitably in any other manner, just as in the United States probably 5 per cent, or more, of the cotton-seed crop is unavoidably "wasted" for similar reasons.

DISCUSSION.

An interesting discussion followed the reading of the paper in which Mr. D. T. Chadwick, I.C.S., Indian Trade Commissioner, Mr. C. F. Cross, F.R.S., Professor John A. Tod, Mr. J. W. Pearson, (Chairman of the British Oil and Cake Mills), Dr. W. Lawrence Balls and others took part. Mr. Chadwick said that Mr. de Segundo's paper dealt with a

process which should be of the greatest interest to India. He would not follow the author into his estimates of what were the possible total outturns of cotton-seed cake and oil in India. Whole cotton seed was the Indian farmers' favourite concentrated food for their cattle, and it would need much effort to persuade them to use cake instead. Yet, in spite of that, cotton seed was crushed for oil in India, and when prices were favourable it was also exported in considerable quantities. The author was right in saying that the presence of these short fibres on the seed was looked upon with disfavour by the export trade; not only were they a waste article, but a deleterious one owing to their causing the seed to heat in transit. The only suggestions hitherto made in India for dealing with them was to destroy them either by abrasion or by ginning. Mr. de Segundo now proposed to remove them in such a way as to give them a real market value.—These fibres also, when removed, could be pressed and baled. The importance of the proposed process to India's export trade was obvious, but it did not stop there. It had a direct bearing on Indian industries. Unless the prices offered for such short fibres by the artificial silk industries were so high as to tempt them to be exported, they should find a ready market among the paper-mills of India which are in need of a local supply of raw material giving readily add easily a good white paper. Another reason why the process should interest India was that undoubtedly the correct position for these machines was alongside the gins employed in removing the spinnable lint from the seed-cotton. The ideal undoubtedly was for the need, after leaving the gins, to be conveyed, preferably automatically, to a series of these machines, which would then remove these smaller fibres so that they could be baled separately and sent to the paper-mills or other factories. The seed bulking more costly than before would go to the farmer or to the oil-mill. He wished Mr. de Segundo had seen his way to give some indications of the outturn of lint per hour and the horse-power used. The process apparently possessed great possibilities of commercial success, and was one eminently suited for Indian conditions. It was a most interesting and stimulating paper. He would only add that Mr. de Segundo had mentioned two machines, one for removing the short fibres from the seed, and one for removing the short fibres from the cotton hulls produced by decorticating the seed. It was the first of these, which had been shown at work that afternoon, that, in his opinion, was the one of the most immediate interest to India. With the development of the cotton-seed crushing industry in India, the second machine, which dealt with the decorticated hulls, should come into operation, as Mr. de Segundo had given good reasons for the view that in a country in which woolly cotton seed is produced, the decorticating system possessed advantages over that of crushing the seed whole.

ECONOMIC NOTES.

OPEN-AIR SCHOOLS.

The Hon'ble Babu Gopabandhu Das spoke as follows on the resolution moved by him at the meeting of the Bihar and Orissa Legislative Council held on the 22nd February:—

"Your Honour,

"The resolution which I beg to move runs as follows:—

"That this Council recommends to the Lieutenant-Governor in Council that in primary and secondary schools of this Province open-air conditions of living and teaching be, as far as practicable, encouraged and that costly buildings of a type as a condition for the recognition of the school be dispensed with where the school can be run on open-air lines with advantage.

"The resolution proposes nothing new. It simply recommends the use of that old universal thing, the first condition of life—I mean the pure air, the virtue of which is little recognized perhaps owing to its abundance in nature. It only emphasizes what medical men are always preaching as the primary requisite for a healthy existence.

"Nor do I ask for a novel experiment; for, your Honour knows that an open-air school is not a mere idea with me. It is not a picture drawn by imagination from the accounts of Asramas and institutions of ancient India. To me it is a fact, an actual thing which I have made, tried, and found sufficiently to stand the test. I would not have ventured to press the Government for its adoption as a system, were I not myself convinced of its usefulness and suitability to the purpose for which it is intended.

"The subject of my resolution is in the first place educational and as such it may fairly admit of an academic treatment for which I am afraid the present is not an appropriate occasion. But at any rate I wish to make it clear at the outset that I claim no originality in the experiment of the open-air system in the education of our youths. The Indian educational system of by-gone days offers a precedent for this and the open-air method has long survived the many changes that have come over the country and has still been lingering in our village *patshalas* and *Tols* though it has now been almost supplanted by close costly buildings. I remember how in my childhood I received my lessons in the village *patshala* under the spreading banyan tree which could give accommodation to children of all

castes, high and low, each occupying his seat separately. In the sacred shade of that historic tree the distinction of caste among the children did almost vanish, a fact, which contributed in no small measure to degree of literacy in Orissa.

"I believe, Sir, most of the members of this Council are aware that the Victoria Satyabadi School, with which I am associated from its inception, is run on open-air lines. It has passed the stage of experiment and during the last ten years of its existence its open-air character has given satisfaction not only to the students and teachers but has also impressed those who have favoured the institution with their kind visits. From the result obtained at Satyabadi I feel myself justified in commending the open-air living and teaching for general acceptance.

"I think, Sir, I have not brought this resolution before the Council too early. The time has come when open-air methods should be introduced in our schools where and when it can be conveniently and advantageously followed. Influenza, tuberculosis and many other infections and epidemics are causing terrible havoc in the country, and medical opinion is unanimous that the use of the open-air is a chief remedy for these diseases. Our boys should learn to value the fresh pure air properly and when its importance is brought home to them they will be our chief agents in making the people appreciate its efficacy.

"There is also another consideration which is not less important—I mean the cost of education. In the meeting of the Select Committee on the Compulsory Primary Education Bill there arose the question of expenditure on education which necessarily involved the subject of school buildings. It cannot be denied that the importance attached to School-houses in our present system entails an expenditure which is by no means insignificant. If the country is to be studied with primary schools, as it must be before primary education is made effectively free and compulsory, enormous expenditure has to be incurred on account of buildings unless there is a change in the existing method and ideas. Everybody who has experience in organizing a school knows very well that the initial chief difficulty is building. Complaint is often heard that inspecting officers look more to the building and furniture than to the actual teaching as if bricks and wood possess all the virtues necessary to make education efficient and effective. Who does not know that for some defects in the school house grants are often suspended, and some times schools are reduced in status and occasionally threatened with abolition.

"That more money is spent on building than is necessary has often been a matter of public complaint. In a country with the traditions of forest universities such a complaint cannot be said to have no meaning. The large rather the lavish, expenditure on school buildings has produced an undesirable impression on the minds of the people which is responsible for the suggestion often made in several quarters that much of the increased educational allotments is deliberately wasted on houses and furniture in the name of efficiency, with the result that the expansion of education has been extremely slow and does not satisfy the growing demand of the country for a wider diffusion of knowledge. In these circumstances, I respectfully submit that it would be not a day too soon to take steps to minimize the cost of buildings.

"From the reply given by Government to a question of mine on the subject it appears that a type plan for middle schools costs Rs. 6,500 and the cost of construction of buildings for the Government high English schools varies from Rs. 1,06,000 to Rs. 1,42,000. These are astounding figures, of course, for a country whose poverty and ignorance make it imperative that its education should be as cheap as possible. It may be said that for private schools such heavy sums may not be necessary but Government schools are the models and departmental authorities will generally demand that private institutions should follow this model. It was to meet this demand that we had to spend a large sum of money on the buildings of the Satyabadi School unnecessarily and quite against our will. Though we followed the open-air system from the very beginning we could not advocate its cause successfully without having a building; for, we would then be misunderstood as trying to make a virtue of a necessity. Many distinguished officers of the department visited the school and seemed to have been favourably impressed with its open-air conditions, but none of them suggested any change in the school buildings which would reduce the cost of construction until Dr. A. Lancaster M. D. London on special duty for Tuberculosis Inquiry, Indian Research Fund Association, expressed his regret at our buildings being so out of harmony with the general open-air life. He writes:—

"In connection with my work, I am naturally interested to a special degree in all attempts to familiarize the people with the work under open-air conditions and it was delight to see how thoroughly the school was being run on simple open-air lines without any sacrifice of real efficiency.

"It was difficult to avoid some feeling of regret that the new buildings necessitated by the recent affiliation of the school to the university should be

of a character so different from the remainder of the school. One would have thought that these buildings also might have been of a simpler character affording necessary protection under more completely open-air conditions.'

"The opinion of so eminent an authority gave us no small support and now we found ourselves in a position to continue our open-air work with some security and confidence. I may however be permitted here to take this opportunity to thank the Hon'ble Mr. J. G. Jennings, C.I.E., who visited the Satyabadi School in his capacity as Director of Public Instruction for his sincere and sympathetic appreciation of our work on open-air conditions and it is no small satisfaction to me that since his visit to the Satyabadi School, he has got a plan prepared for primary schools on open-air lines and forwarded copies thereof by his circular letter of the 27th May 1918, to all Chairmen of District Boards of the Province. But it is a pity that the matter did not proceed further and it did not receive the consideration of the local authorities to which it was undoubtedly entitled. It need hardly be said that the step taken by the Director of Public Instruction amounts to a practical acceptance of the system I propose. As a matter of fact the Hon'ble Mr. J. G. Jennings called his plan the plan of 'the open-air primary schools.' My resolution asks for a wider application of this plan and proposes to make the secondary schools run on open-air lines. In this I am supported by another educational officer of thought and independence of judgment. Mr. R. McCombe, M.A., Inspector of Schools, Orissa Division in his inspection note on the Satyabadi School.

"However, a valuable lesson has been learnt from the experiment here made. It is clear that a High School in India can be sufficiently conducted through the greater part of the year in the open-air provided it possesses a piece of land shaded by plenty of trees. And it appears that for use in the rains a building of the simplest description, consisting mainly of roof and partition wall is all that is required.

"From the experience I have been able to gather by practical working and the suggestions received from the action and opinion of high educational and medical authorities, I think, I am now in a position to lay out a scheme for the formation of open-air classes. Places of natural advantage should always be sought for the work. Almost every village in this country can afford one such spot. The shady mango topes in our rural areas would be exceedingly suited to characteristic open-air classes. Where natural shade is wanting trees may be grown.

"Buildings cannot however be dispensed with altogether. They would be necessary for wet weather. But they should be of the simplest description. The wall should be only four feet high but the rooms should be separated by partition walls raised high up to the roof. The roof should be so sloped as to cover a spacious verandah outside the class. The roof may be of any material, straw or tile, that may be cheap and available in the locality. A building of this description does not materially differ from the Hon'ble Mr. Jennings's plan of open-air primary schools which also answers to the character and description of buildings indicated by Mr. McCombe. Some of the classes of the Satyabadi School are held in buildings of this type and they are found to work comfortably.

"In a conference of the deputy inspectors of schools of the Orissa Division, I was given the pleasure and privilege to propose planting of trees in school compounds. It was accepted and at the instance of the then Inspector of Schools Orissa Division Mr. W. V. Duke, president of the conference, the department has given effect to the proposal, for which I am sincerely thankful.

"Thus the steps hitherto taken by the department meet my resolution half-way. Its acceptance by Government would only encourage the department to follow up these steps further and would, give educational officers the authority and the public, the sanction, to work out the open-air idea with great completeness and courage.

"Not only in schools but also in hostels open-air line should be followed. Hostels attached to Government high schools are costly buildings. Consequently the Boarders have to pay a high rate of seat rents. The wisdom of the system is very doubtful. Most of our student come from villages where they live in thatched houses and huts. When they come to the school hostel they find themselves under changed conditions. The change may and does, no doubt, bring them greater comfort which to most of them is a luxury. In a few years the boarder becomes so accustomed to living in such costly surroundings that he probably begins to look down upon his own village and its people. Moreover, except a very few of the students others in their after life are unable to afford to live in such costly quarters and discontent throughout their lives is an inevitable result. It is certainly not a 'divine discontent. I admit, education should raise the standard of living. But plain living and high thinking should be a better and more desirable standard to be placed before our students.

"I believe I have sufficiently explained the importance of an open-air school from economic considerations. If the Government think that costly

buildings will in the long run secure greater economy, they may raise such buildings. But the less the cost, the better, and the savings thus made can be utilized in other directions, say on a library and on tuition, to effect real improvement in the efficiency of the school. I plead specially on behalf of private schools. I do no doubt that their management under completely open-air conditions will remove in a considerable degree the financial difficulties which they have to face in the beginning of their life and which in many cases renders their development almost impossible.

"The importance of the sanitary consideration already indicated should not be overlooked. On this point I have to refer again to the Satyabadi School and I may be pardoned for such frequent references which in the circumstances of the case become unavoidable. Most of our boys are poor. They have to live on simple poor diet, but they are not poor in physique for all that. I respectfully invite your Honour to bear testimony to their physical strength and agility. They were free from influenza which was prevalent on all sides at their very door. If there be one thing more than another to which the healthy cheerful life of the Satyabadi students is due, I would unhesitatingly point to the fresh open-air in which they live, move and have their being. Allow me, Sir, to say that we have so long been courting insanitation, illhealth dyspepsia, loss of eye-sight and all such complaints at a very heavy price. Let us now pull down the walls of our schools so that our children may live a healthy and simple life in a free atmosphere, as the children of nature. Let not the place of instruction give a sense of confinement to the child. Let it be at once his school, his play ground, and the place for his recreation.

"As a place of instruction an open-air school is best suited for teaching almost all subjects that do not require experiment in a laboratory. Nature study which forms so important a part in a child's education can be done successfully only outside the school room. An open-air school affords greater scope to the teacher to carry on the direct method of teaching. Lessons on poetry, drawing, botany and hygiene can be imparted in gardens and groves in the open-air with better effect. Let the student see living nature himself with his own eyes and enjoy the sweet sounds and serene beauties around him. Such a direct contact with nature would lend his lessons a life and a force which would be utterly lacking in a closed class room. It would certainly expand his mind and bring it into communion with the 'spirit' which is 'in the wood.' Is this not a higher standard of living, worthy of being sought at the sacrifice of the luxury of living in a place?

"Considered from any stand point, an open-air school proves itself to be a distinct advantage. 'It is strange,' says Mr. Mc Combe, 'that it has taken so many generations to make this discovery'. The discovery has, however been made and the truth found out. It is now for the members of this Council and for your Honour's Government either to receive or reject this truth.

EDUCATIONAL SYSTEMS OF MADRAS AND BOMBAY.

Report by Director of Public Instruction.

The following is the summary, published in the *United Provinces Gazette* of April 5, of the reports on visits by Mr. C. F. D. E. La Fosse, Director of Public Instruction Provinces, to educational institutions in the Bombay and Madras presidencies:—

After visiting a number of educational institutions of all kinds in the Bombay and Madras presidencies I have gathered together from my notes on individual institutions some general conclusions which may be worth considering in connection with the reform of the educational system in the United Provinces which his Honour the Chancellor foreshadowed in his Convocation address.

While it may not be altogether wise to allow school students an unlimited option at a final school examination in the selection of additional subjects, there is something to be said for it, if it encourages the study of additional subjects which are likely to prove useful in after-careers. In the Madras Presidency it is possible for a scholar to specialize to some extent in such subjects as Mathematics, Physics, Chemistry, Botany, Drawing, and Commerce by studying one or more of them as additional optional subjects. Students usually select their additional subjects with a definite aim; for example, Chemistry and Botany are often taken by boys who wish to join a medical school. The central board of the school leaving certificate examination in the United Provinces might well consider whether candidates should not be encouraged more than at present to take one or more additional subjects at the school-leaving certificate examination, and whether the courses in additional subjects could not be more closely adopted to the future careers of candidates. It might thus be possible, perhaps, to encourage more candidates to stay on at school for another year or two, instead of, as so many now do, in going to a college with no higher aim than passing the Intermediate examination of

the Allahabad University. A University Intermediate examination, being intended merely as a stage in the progress towards a degree, should not be an end in itself; it has, however, come to be regarded as a definite educational qualification.

ENGLISH THROUGH PHONETICS.

In more than one school which I visited, I found good use being made of phonetics in teaching English. Interest in the subject had been stimulated by a lecturer in phonetics from Great Britain who had been employed by the local Government to introduce the subject to the notice of schools. I was struck by the way in which even quite young students understood and appreciated the phonetic method. In one school it was noticeable that the students who had been taught English with the help of phonetics pronounced more correctly and read better than boys of higher classes who had not had the benefit of this system. This is a matter into which we might look.

In Madras and Bombay there are compulsory courses in elementary science. The object of the courses is to acquaint students with the few elementary facts of science which every boy and girl should know and to awaken an interest in Nature study. The courses are, therefore much wider than they are deep; but when allowance is made for the difficulties in the way of teaching such courses, it must be admitted that superficial as the knowledge imparted must be, they widen the outlook of the ordinary student and lay a foundation upon which students, with an aptitude for Science, can later build up a sound knowledge. I gained the impression that in Madras, at any rate, the study of science by those who took one of the science subjects as an additional subject for the school-leaving certificate examination was more intelligently pursued and that better progress was made than ordinarily under our system of Science teaching. I think this may be in part due to the elementary course in Science taught in lower classes. The whole question of Science teaching in secondary schools in the United Provinces seems to me, in the light of what I saw in Bombay and Madras, to deserve fresh consideration. No student should be allowed to pass through the school course without acquiring some general knowledge of a scientific kind, and efforts should be made to carry the knowledge of Chemistry, Physics or Botany, for instance, higher than at present, in the case of some of those who take up Science for the school-leaving certificate.

Our school-leaving certificate schemes of work and examination seem to be on the right lines and less open to criticism in some aspects than those of the presidencies I visited. I had an opportunity of discussing with principals of colleges and professors of Science the general standard attained by school-leaving certificate candidates. Speaking generally in

Madras they are of opinion that the work in Mathematics and science had been steadily improving in schools as a result of the school-leaving certificate in the case of the better candidates, but that it was not so high in Arts subjects, owing to the nature of the tests. The University of Madras has had to take steps to ensure that candidates are not admitted to colleges unless they come up to its requirements. This is said to be affecting the popularity of the school-leaving certificate.

UNIVERSITY FAILURES.

A problem which is exciting a good deal of interest at the present time in Madras arises out of the heavy failure of candidates at University examinations. There are two camps of disputants; one holds that the heavy failures are due to the mistaken policy of the University in arranging its courses to suit the needs of those only of more than average ability. The other party holds that the University is right in concerning itself with the maintenance of a high standard instead of adapting its courses to the capability of the weaker student. The controversy really seems to turn upon the question of finding other avenues for employment for Indian youths who are not able to benefit to the full by University studies. The reason why so many now attempt to pass examinations which are beyond their capacity is that a certificate of having passed a University test is the ordinary passport to service. I mention this controversy, without expressing my view upon the dispute, because the Allahabad University meets with the same sort of criticism as the Madras University, namely that in pursuance of a definite policy it 'slaughters' somewhat ruthlessly a high proportion of the candidates who appear in its examinations. On this question differences of view are the result of disagreement of fundamental conceptions of the ideals of a University. It amounts to this; should a University aim, as some of the American Universities seem to aim, at giving to as many as possible the opportunities of acquiring some University culture or should a University devote itself to the advancement of knowledge and endeavour to maintain a high standard of learning? If it follows the latter course, must it not confine itself to teaching only the elect? Experience inclines to show that it cannot do both; for the admission of a large number of students of mediocre ability tends inevitably to a lowering of standard.

THE HONOUR COURSE.

As the question of honour courses at the B. A. stage frequently arises in the Allahabad University, I made enquiries into this matter at two or three colleges. Students who take the 'pass degree' have to appear later in an examination for the M. A. degree, if they wish to obtain it. Students who take the Honours examinations in the B. A. proceed to

the degree of M. A. later without further examination. The standard of the M. A. examination is slightly lower than the standard of the Honours examinations at the B. A. stage. This has led to some confusion in the value attaching to an M. A. degree. The better colleges and the better students prefer the Honour Courses at the B. A. stage to a pass degree at the B. A. stage, followed by a further course of study for the M. A. examination. One advantage of the Honour Course, from the clever student's point of view, is that it takes only three years' continuous study after the Intermediate stage, while the pass courses for the B. A. and for the M. A. degree take in all, four. More than one professor told me, however, that there was a drawback to the Honour Course, namely, that it put too great a strain upon all but the best students in their struggle to cover the course fully in three years. One or two Science professors thought that it would be better to make it a four years' course. As a matter of fact it is in actual practice often a four years' course; for quite a number are not ready for examination in three years. A professor of English thought that the course in English had become overburdened with archaic English and Anglo Saxon, merely with a view to stiffening it for the purpose of honours. After what I learnt on the spot about the working of the Honours Courses in the Madras University, I think that the Allahabad University has been wise to resist the efforts made to introduce Honours at the B. A. stage. The advantages do not seem to me to outweigh the disadvantages. It is perhaps better to complete the general education of students at the B. A. stage and reserve more specialised studies for post-graduate courses, along the lines of the M. Sc. and M. A. degrees of the Allahabad University.

INSPECTION OF SCHOOLS.

Arrangements for the inspection of schools in Madras and Bombay are not very dissimilar from those in the United Provinces, but the Madras Government has been quicker than any other to recognise the need for increasing and improving the quality of inspection. The Secretary of States's sanction has been received to a scheme under which the number of circle inspectors will be increased be from 9 to 25. The majority of them will be members of the Indian educational service. In the matter of actual method of inspection of schools, I do not think that we have much to learn from either Bombay or Madras, but in both the work of inspectors is more closely supervised. In both, at present, the examining of inspection reports sent in by the subordinate staff and the passing of orders upon them puts rather too heavy a strain upon the controlling authorities;

but when the number of circle inspectors is increased, as proposed, this should no longer be the case in Madras. I think that there is a good deal to be said for the exercise of a closer check over the work of the subordinate inspecting staff but I would not curtail the freedom of divisional inspectors by passing their reports under regular and systematic review; it might tend to weaken initiative; besides, report-writing is, in their case, less important than their personal influence brought to bear in discussion with the management and staff. The Bombay system puts somewhat less strain upon the inspector than that of Madras. The Inspector is given a personal assistant of the rank of deputy inspector and most of the routine work of examining reports is done for him by his personal assistant who makes notes for him on cases which require orders. I am not sure whether it is altogether wise to put so much power, even indirectly, into the hands of an officer of the same standing as those whose reports he examines, and the late Mr. Sharp perhaps had this in mind, when, shortly before he died, he proposed to create assistant inspectors. After going thoroughly into this matter, I came to the conclusion that we should do well, in the United Provinces, to arrange in some way for the regular checking and examining of the work of the subordinate inspecting staff. It is possible however to overdo it; and seemed to me that, in some instances, the examining and checking was rather mechanical, and that it had a tendency to make the reports rather wooden and to stereotype their form. These are dangers to be carefully guarded against.

TRAINING OF TEACHERS.

In the extent to which arrangements have been made for the training of teachers Madras is a head of the rest of India, but I did not find much in our system which seemed to need modification in the light of what I saw in either in presidency. More attention is paid both in improving the general education of elementary teachers perhaps than with us, and a higher standard of theoretical knowledge is attempted in elementary as well as in secondary training in Madras; but in neither is there so systematic a training in the practice of teaching as with us, and physical training did not strike me as so well organized. It was only in regard to details that I found points in which we might endeavour to emulate them. For instance the arrangements for training Science teachers at Saidapet could hardly be bettered; but then the pupil teachers were generally better qualified than ours to take full advantage of them. In Madras and to a less extent in Bombay, the work in Drawing and Nature Study was in advance of ours.

In this matter we have recently pursued a rather timid policy and have in consequence, dropped behind. We ought now to make a determined effort to recover lost ground. The results achieved in both presidencies show that there is no good reason for hesitating because our teachers may possibly not be equal to the work. They can be made so, and some who have an aptitude for the work will make themselves so if given the chance. The best work I saw in Botany on my tour was being done by a young teacher who started with the handicap of a defective education. He had more than made up for these deficiencies by study and experiment.

In both Bombay and Madras female education is far in advance of female education in the United Provinces is largely due to the fact that it is not hampered in either presidency by the *pardah* system, except to some extent in the case of Musalman girls. There are no serious difficulties in either province in obtaining educated women teachers nor in getting women to go to training institutions. Nor do there seem to be the same objections to the employment of male teachers, in cases in which women teachers, with the necessary qualifications, are not available. There is, for this reason, very little to be learnt which would be applicable to the United Provinces. The Government schools for girls in the Bombay and Madras presidencies are very flourishing institutions. At the head of both are English ladies, and in Madras itself the Government girls school has no less than three well qualified English ladies on its staff. We could not do better than follow the example of the Madras Government. The school is so popular with the parents that it has been found necessary to raise the fees more than once with a view to keeping admissions within reasonable bounds. The fee charged at present is actually higher than that charged in many aided schools for boys. There can be no doubt that the girls appreciate their English teachers; and their English teachers are equally devoted to them. The relations between them are very happy. But a solitary, English lady at the head of high school for girls is apt to be overburdened with work, as I found to be the case in one of the schools which I visited. To obtain the results from the employment of English ladies it would be better to have more than one upon the staff of a Government high school for girls. The question of admissions has caused difficulties. Parents are naturally more particular in the case of their daughters with whom they associate than in the case of boys. This difficulty has been met in the Government girls' school at Poona by handing over to a committee of Indian gentlemen the

nomination for admission. We might well adopt a similar plan in connection with the Government girls' schools which it is proposed to open for girls of the better class at Lucknow.

WIDOWS AND POOR GIRLS.

I visited Mrs. Ranade's philanthropic institution for widows and poor girls. We need very much in the United Provinces some institutions of the type of the Seva-Sadan; but we should need at its head some one with the devotion and philanthropy of Mrs. Ranade. In the United Provinces, where the *pardah* system so greatly interferes with the employment of women, there is a more pressing need for an institution which would help widows in particular from destitution and from worse. The Seva-Sadan has given to many a widow and to many a poor woman a new interest and purpose in life. If some one could be found to start such an institution in the United Provinces it should receive from the start generous assistance from Government. It is a mistake to defer assistance until the institution has grown to large proportions. Private enterprise, un-aided by Government, is not ordinarily equal to making suitable and satisfactory provision from the commencement. It has to improvise too much with slender resources. In this respect the Vanita Vishram, the Widows' Home at Bombay, is a better model. The two philanthropic ladies who started the institution succeeded in obtaining from the start generous help, and having gained their experience elsewhere they made no grave mistakes in organization. At the Vanita Vishram there was a most useful department for training woman teachers. A good many of the widows living in the institution were receiving a full training there; others of the students who came from outside were engaged in teaching in schools in the town and attended at the Vanita Vishram for evening training classes. It shows that there is plenty of enthusiasm for their profession among the women teachers of Bombay. An institution in the United Provinces which combined the good points of the Seva-Sadan and of the Vanita Vishram would confer an inestimable boon upon widows and other women who might find it necessary to earn their own living.

I was able to find time for a visit to the Victoria Jubilee Technical School at Bombay, and I have already sent to Government un-officially a note dealing with certain aspects of the Technical Institute, and with my views on some matters connected with technical training generally. It will be enough here if I mention that I am convinced from my visit to the Victoria Jubilee Institute that an institution for Mechanical and Electrical Engineering and Textile manufacture gains enormously by being situated in a great industrial and manufacturing centre. The

leading business-men of Bombay have always taken a close interest in the Institute and have held out to it a guiding hand. Being interested in the school they are also interested in the products of the school, and, though difficulties are, of course, met with in placing the passed students of the Institute, men of ability and grit have found good employment, and some indeed are occupying very important and responsible positions. I am inclined them to the view that for the success of an institution for Mechanical and Electrical Engineering and Textile manufacture in the United Provinces, Cawnpore would be the best situation. I doubt whether such an institution could be made a real success in any but a manufacturing and industrial centre.

AGRICULTURE.

Maize as an Emergency Crop.

The Department of Agriculture, Bombay, has issued the following Leaflet (No. 10 of 1918.) on Maize as an Emergency Fodder Crop :—

When the rains fail, and fodder is more and more difficult to get, it becomes a matter of importance to grow that crop, with the available water, which will yield a large and quick return. The crop most suited for this purpose will vary with the season, but in most parts of Western India, maize will furnish a large amount of fodder, will grow very quickly, and can be grown at any time of the year. *It is particularly recommended for putting in the seed in January or the early part of February in the greater part of Western India.*

When grown as an emergency fodder crop in this manner, maize should be grown thickly, drilling the seed into the land in rows nine to twelve inches apart, and using fifty to sixty lbs. of seed per acre. The land should be well cultivated and manured with cattle manure or any other refuse before putting in the seed.

The crop requires frequent irrigation if the best results are to be obtained, and the land between the rows should be hoed with a bullock hoe once during the growth of the crop.

The maize can be cut and fed to animals at any stage, but the best returns are obtained if the cobs are allowed to form, and if the crop is cut when the grain is still soft. To obtain this, the crop requires from two to two and a half months to grow.

When grown on well cultivated and manured land, and cut at the stage suggested, maize should yield from 15,000 to 20,000 lbs. of green fodder per acre, provided it is grown on good, well-drained land.

Till the middle of February, maize is recommended as the best emergency fodder crop to grow both in Gujarat and the Deccan. After that date some form of hot weather *jowar* is to be preferred.

BOARD OF AGRICULTURE, UNITED PROVINCES.

We take the following Resolution of the Government of the United Provinces from the *United Provinces Gazette*, of 8th February, 1919 :—

In a recent resolution on the annual report of the Department of Agriculture, His Honour the Lieutenant-Governor expressed the opinion that the time had arrived for the constitution of a Provincial Board of Agriculture which would meet regularly and advise on policy and administration. His Honour has decided that a Board of Agriculture should be established with effect from the 1st of April, 1919. The constitution will be as below :—
The Board shall consist of fourteen members, *viz.* :
(1) The Director of Agriculture, Chairman *ex-officio*,
(2) One member to be elected by the Upper India Chamber of Commerce, (3) One member to be elected by the United Provinces Chamber of Commerce, (4) One member to be elected by the British Indian Association, Oudh, (5) One member to be elected by the United Provinces Zamindars' Association, (6) and (7) Two numbers to be appointed from amongst non-officials by the Local Government, (8) Chief Engineer, Irrigation Branch, (9) Registrar, Co-operative Societies, (10) Chief Conservator of Forests, (11) Principal of the Agricultural College, (12) and (13) Two officers of the Agricultural Department nominated by the Local Government, (14) Deputy Director of Land Records.

The Board will have power to appoint committees for particular objects and to co-opt for the purposes of these committees not more than two officials and two non-officials from among persons other than members of the Board.

The nominated and elected members will hold office for three years and will be eligible for re-nomination or re-election, as the case may be.

The duties of the Board will be mainly advisory. Its functions will be to advise the Government and the Director of Agriculture with regard to such

matters as may be referred to it by the Government or by the Director for an expression of its opinion, but it may also advise in relation to any other matter which, with the permission of the chairman, may be brought before it by any member. The Governing Body of the Cawnpore Agricultural College will continue to be the adviser of the Local Government with regard to the affairs of that college. The Local Government will every year place at the disposal of the Board a sum which the Board will be able to utilize for any suitable purposes, including non-recurring grants to private persons or farmer with the object of the general agricultural improvement of the province.

The Board will meet on such dates and at such places as the chairman may decide. A meeting should be ordinarily held once a quarter. Papers may, if the chairman considers fit, be circulated among the members of the Board.

Members of the Board shall draw travelling and halting allowances as laid down for officers of the first class.

In the event of a difference of opinion among the members present at a meeting the opinion of the majority shall be held to be the opinion of the Board, and if the voting on any question be equal the chairman shall have a casting vote.

Any member can record a minute of dissent and the same shall, if the members so requires, be recorded in the minutes of the proceedings.

The personal Assistant to the Director of Agriculture shall be *ex-officio* the secretary of the Board. The duties of the secretary shall be—(1) to prepare the agenda of the Board's meeting and to circulate the same among the members at least ten days prior to each meeting, (2) to lay before the Board all matters for discussion, (3) to conduct the correspondence of the Board and (4) to prepare, keep, and circulate among members the minutes of the proceedings of the Board.

Sir Harcourt Butler attaches great importance to the association of non-officials and officials in this most important matter, and will always be glad to receive proposals which will make the Board more efficient. He thinks that the above outlined constitution will be a good beginning for practical work.

INDUSTRIES AND COMMERCE.

Sandal-wood Trees.

The following G. O. No. R 8145-54 Ft 176-17-9, dated 4th January of 1919 has been issued by the Government of Mysore:—

The recommendations of the Committee are as follows:—

1. Waste lands should be given out on shraya tenure.
2. Inamdars should be encouraged to plant sandal trees on their waste lands.
3. Land-holders should be encouraged to dibble sandal seeds on all vacant lands round their holdings.
4. Areas selected for plantations should be half a mile distant from villages.
5. The sale proceeds of mature trees should be divided equally between Government and the planters.
6. The choppings from the trees should be given to the owners of the lands who pay assessment.

2. The Revenue Commissioner states that the proposal to grant waste lands on shraya tenure for sandal-wood plantation may be given a trial wherever such lands are not reserved or required for other purposes, that the third proposal does not commend itself to him and that the other proposals are matters for the orders of Government.

3. The Conservator of Forests is of opinion that the rules contained in the following Government Orders provide for efficient preservative measures as regards the *existing growth* both on occupied lands as well as on lands that may hereafter be granted for occupation, besides affording sufficient incentive for the occupants to carefully protect the growth and that no further concession is called for, specially as the occupants have neither undergone any trouble nor have been put to any expense on this account. As regards new plantations however that may hereafter be raised the Conservator of Forests recommends that in return for the expense, care and labour involved for a number of years in their rearing, the planters may be shown the concession of sharing the net proceeds equally with Government in the maidan parts and to the extent of 25 per cent in the sandal tracts of the malnad:—

Notification No. R. 7710—L. R. 319-08-1, dated 25th March 1909.

Notification No. R. 10916-25—Ft. 163-09-16, dated 25th March 1909,

Notification No. 7709—Ft. 13-05-18, dated 25th March 1909.

Notification No. 7191-201—Ft. 191-13-2, dated 19th February 1915.

4. Government are now pleased to direct that waste lands may be given out on shraya tenure for sandal-wood cultivation wherever such lands are not reserved or required for other purposes. The exact terms on which the lands may be given out should be decided with reference to the merits of each individual case,

5. Raiyats raising plantations under this order will be entitled to 50 per cent of the net value of mature trees removed from such plantations in the maidan taluks and 25 per cent in the malnad taluks. This rule will apply also to Inamdars who are not at present entitled to the sandal trees on their lands.

6. Government consider that no action is necessary on the other recommendations of the Special Committee.

PROGRESS OF INDIAN INDUSTRIES.

Mr. F. H. Brown writes in the *Times Trade Supplement* :—

For the direction and co-ordination of the general industrial policy of India, Sir Thomas Holland's Industrial Commission proposed the creation of an Industries Board of three members, the president to be a member of the Viceroy's Executive Council.

For the latter arrangement Parliamentary legislation would be required, and the recommendation has too important a bearing upon the problem of decentralization in connection with the impending reforms to be summarily decided. Yet if the policy of earnest industrial development is to be promptly tackled, it is of the utmost importance for India to retain the services of the accomplished scientist and organizer who did such signal service as head of the Indian Munitions Board, and who presided over the investigations of the Commission. Mr. Montagu has been well-advised, therefore, to agree to the appointment ad interim of Sir Thomas Holland under the designation of Industrial Adviser to the Government of India.

In reference to the fears expressed in many quarters as to the centralizing effects of setting up the proposed Board, the Viceroy has told the Legislative Council at Delhi that he regards an Imperial department as necessary to supply the desired stimulus to industrial development; but he recognizes that a provincial organization must carry out the

actual work of development under provincial control. A further argument in support of the proposal was supplied by Lord Chelmsford's reply to those who see grounds for fear that British commerce may be prejudiced by the political changes in contemplation. He said that under the scheme for which he and Mr. Montagu are jointly responsible matters like railways, currency, banking, shipping, factories, petroleum, explosives, and mines would remain with the Government of India, while commerce would make its voice heard as effectively as before in the provincial Legislatures. He reminded the Council of the pledges of the report to reserve to the Government power to protect any industry from prejudiced attack or unfair competition; and he intimated that all Governors on appointment would be informed by the Home Government that this pledge must be made good.

THE CASE FOR ENERGETIC ACTION.

It is natural for business men in this country to maintain the habit of regarding India first from the commercial point of view as a good customer. In this connexion the sound claim of advocates of the far-reaching proposals of the report is that industrial development will increase local wealth, and therefore the purchasing power of the country. This view is supported by past experience, and is peculiarly pertinent at a time when in large parts of the country there is unemployment and distitution, met by a system of famine relief, because the agricultural work on which the everwhelming mass of the population depends has been largely suspended owing to the partial failure of the monsoon rains.

The development of local manufacturing industries will open up further avenues of employment, and will certainly be accompanied and followed by an increase in the total external trade. Of course, there will be displacement and readjustments and it cannot be expected that any given commercial firm will view with complacency, changes in the nature of our export trade that result in disturbance of its own particular and accustomed line. It may be further urged that under Indian conditions industrial progress will be relatively slow and fluctuating unless the Government make a very definite move forward.

Close study of the problem has convinced the authorities in India that a change is necessary, not only for the general benefit of the country, but because it is dangerous to run the risk again of India being isolated, even temporarily during a war. The experience of the last five years has brought home the hitherto neglected consideration that under modern conditions nine-tenths of the materials required by an army in the field are similar to those of ordinary civil wants. There

are thousands of things, it will be necessary, to make in India if she is to fulfil her role as the ordinance base for British activity in the East. Most of these will never be made without Government encouragement and stimulus. The best firms can make money easily enough by simple trade, and do not wish to tie up their capital in plant and buildings. The staff of most English firms in India is sufficiently equipped for ordinary trade problems, but is lacking in scientific and technical experts. Consequently, for these firms to enter the industrial world is a step in the dark, since every modern industry is based on some branch of science or technology.

It is important to remember that the requirements of an army to-day will not cover the needs of military operations ten years hence. Consequently, the provision of facilities to manufacture the list of articles required by the army of to-day will not be sufficient. India must maintain a technical staff, including a sufficient variety of high class experts to enable the country to move with the times, and to modify its industrial activities as they develop in other countries.

How valuable an industry can be in assisting to maintain vital interests has been shown by the output of the Tata Steel Works since the summer of 1914. It is not too much to say that, if those works had not been brought into operation shortly before the war, we should have been faced with serious disasters in the East. The Tata works supplied practically all the structural steel required for military lines and other purposes in Mesopotamia, Palestine, and East Africa, as well as the rails used for urgent renewals in India. A dozen more such industries in existence before the war would have made an enormous difference to the operations east of the Mediterranean and would have saved thousands of lives.

FOREIGN COMPETITION.

It is well-known that Japan is pouring material into India, and Japanese firms are buying up land and house. Our absorbing pre-occupations with war requirements gave them opportunities in respect to the Indian market, of which they have taken full advantage. This fact adds to the necessity and urgency of moving with a view to making India more self-contained from the industrial standpoint. It is futile to talk of protection and the benefits of a tariff, as Indian politicians do, so long as the country has little or nothing worth protecting. The tariff powers sought by uninformed Indian orators would merely protect extremely cheap and nasty articles; no real development would occur, and when the time of stress came again, India would be unable to rely on her own resources.

Another consideration is the necessity for accompanying the impending political reforms with industrial reform. The extremists who clamour for immediate provincial autonomy are unconscious of the fact that administration is as much a technical art as carpentry, requiring an apprenticeship and practical experience. It is recognized that we must equip young Indians with suitable administrative capabilities by a much larger infusion of them into the civilian services; and one of the best ways to do this is through the industrial door. The reform structure will be unsafe, unless special means be adopted to strengthen the foundations, and one of the most important of these means is an active industrial policy. There are highly competent observers who hold that unless such a policy is pursued vigorously on a scale at least approximating to that indicated in the report, there will be serious retrogression within the next five or ten years.

PUBLIC HEALTH AND SANITATION.

Report on the Epidemic of Influenza.

The following G. O. (No. G. 19409-21—Med. 56-18-96, dated 4th March 1919) has been issued by the Government of Mysore:—

The epidemic made its appearance in a mild form at Bangalore in July 1918 but died out soon after without causing any serious loss of life. It re-appeared in a virulent form in the middle of September and spread with alarming rapidity throughout the State. No district was free and very few villages escaped. The disease began to decline from the middle of November and subsided by the end of that month.

2. The Sanitary Commissioner states that it is not possible to connect the occurrence of the epidemic to meteorological or any other known specific cause. The severity of the disease and the symptoms thereof varied with individual constitution, age and to some extent, according to locality and it was not possible to follow any uniform treatment. Some times the respiratory organs were affected and in many cases pneumonia developed owing to mixed infection. Investigations were carried out in the Public Health Institute to find out if the pneumonia supervening on the attacks of influenza might be some form of pneumonic plague and the results proved that there was no foundation for such a theory.

3. The distress became acute as whole families were laid up and there was no one to attend to the wants of the patients. A census taken in the Bangalore City on the 6th and 7th of October revealed the

fact that as many as 10,000 patients were suffering from the disease on those days. The distress was further aggravated by the abnormal rise in the prices of food grains and shortage of supply in the market.

4. The total number of attacks according to the returns furnished by the Deputy Commissioners was 8,83,491 and the total number of deaths was 4,66,391 or 20.1 per mile of the population. The Tumkur District suffered most with a total mortality of 35,260 and Kadur the least with a mortality of 5,867. Out of a total of 40,000 attacks in the Bangalore City, 2,074 proved fatal; the highest mortality in any one day was 142 and it was reached on the 25th October. In the Mysore City there were 36,550 attacks and 1,296 deaths. The attacks and deaths in the Lunatic Asylum 12 and 2 respectively; in the Central jail, Bangalore, 292 and 20 and in the Mysore Jail 147 and 3. These figures go to show that with proper sanitary surroundings the mortality could be reduced to the minimum.

5. A special ward was first opened in the Epidemic Diseases Hospital, Bangalore, and to prevent overcrowding and minimise inconvenience to the patients, dispensaries were ordered to be kept open from 7 A.M. to 12 noon and again from 4 P.M. to 8 P.M. But as the disease spread, accommodation was found insufficient and so a temporary Hospital under canvas was opened in a convenient part of the City. Altogether 1,062 out-patients and 198 in patients were treated in this Hospital; out of these, 54 died or 28 per cent of the total number admitted. One hundred and one patients were treated in the Epidemic Hospital, Mysore. Out of these, 30 died giving a death rate of 29.7 per cent of admissions.

6. Batches of medical students were deputed to work in conjunction with the medical subordinates in the Cities of Bangalore and Mysore. In other Municipal towns, the treatment and care of the sick was left to the Sub-Assistant Surgeons in charge of the Dispensaries. Patients suffering from Influenza were admitted freely in the Mission Hospitals of Kolar and Chikballapur.

7. The medical staff was suitably augmented but as the disease spread, the demand became so great that it was not possible for the regular staff to cope with it. Qualified medical men were not available as they were in demand in all parts of India which were likewise affected and the services of local Pandits and Hakims had therefore to be utilised for the purpose. Government are glad to observe that the Pandits and Hakims did yeoman service and treated successfully a large number of patients in the cities and villages.

8. As the situation demanded rapid iteneration on the part of the medical officers, permission was

accorded to the District Medical Officers to engage motor cars to enable them to travel as rapidly as they could to give medical aid and relief to the people in the outlying parts of their districts. The Sub-Assistant Surgeons itinerated within their areas and supplied medicines to patients in the villages.

9. Special accommodation was provided for housing the sick by erecting sheds near the dispensaries, in the districts of Kolar, Tumkur, Kadur and Shimoga.

10. A sufficient quantity of medicines was supplied by the Senior Surgeon to all the permanent, temporary and itinerant dispensaries. Thymol, which was used, both as a curative and as a preventive, was issued from the Public Health Institute, to all the districts and cities. Leaflets explaining the nature of the disease and detailing the precautionary measures to be adopted were issued by the Sanitary Commissioner. Sufficient provision was also made for water-supply and fuel at the cremation grounds.

11. Relief parties were organised for the distribution of medicines, milk and conji to the poor and suffering. In several places, private gentlemen fully realised the needs of the situation and readily came forward to afford their help for the relief of the sick and the poor. The progress of relief measures was greatly furthered by the institution in each local area of Special Committees consisting of the most influential of the leading citizens and the chief local officers. A very gratifying feature of the relief measures was the spontaneous response of the student population to the call of the Municipality and their ready and willing co-operation with the official organisations for the relief of distress.

12. Out of the total allotment of Rs. 1,13,866, sanctioned by Government from time to time for adopting measures to combat the Influenza epidemic in the State, an expenditure of Rs. 81,386, incurred, of which a sum of Rs. 32,186 was for the supply of medicines.

13. Two statements are appended to this order one showing the number of attacks and deaths and the other expenditure incurred in the several parts of the State.

14. Government are pleased to place on record their appreciation of the good work done by the Presidents of the Bangalore and Mysore City Municipalities, the Deputy Commissioners of Districts and the Officers of the Revenue, Medical and Sanitary Departments and the several Municipal Committees and public spirited citizens who spared no pains to alleviate the suffering of the poor people. Special credit is due to the many voluntary associations like the Amateur Dramatic Association, the Boy Scouts, etc., who rendered valuable help in taking medicine and nourishment to the doors of the sick and the needy.

CO-OPERATION.

Vellore Co-operative Conference.

Speaking at the Before Co-operative Conference the Honble Mr. M. Ramachandra Rao, High Court Vakil made some interesting remarks. The following extracts are taken from his address :—

I am thankful to you for the honor you have done me in asking me to preside over this, your first conference of co-operators in your district. The people of the district have now a unique opportunity to push the movement in all directions in the district under the wise guidance of Dewan Bahadur Swamikannu Pillay, and I trust you will not be slow to fully utilise your opportunities. It must be recognised that the co-operative movement has not hitherto made the same headways in the Talugu districts as in the Tamil districts. The want of official enthusiasm for the spread at the movement was hitherto one of the contributory causes; but with the appointment of Rao Saheb R. Nageswaram, Messrs. V. Lakshminarasimha Rao and T. Srinivasa Rao we have three officers whose devotion for the cause of co-operation, and whose influence with the people have resulted in giving the necessary stimulus to the movement. Large bodies of influential non-officials in the districts such as the members of local board and municipalities, and the members of Union Panchayats are still untouched. Our main duty for some time to come is the propagation of the gospel of co-operation.

AGRICULTURAL INDEBTEDNESS.

In a district like yours with 402 villages you have only 78 societies with a membership of 2,426. Almost all of these are agricultural credit societies. Your turn-over for the whole year, in all these societies is estimated at Rs. 75,000. I venture to think that it is hardly satisfactory in a district, which offers such a suitable field for co-operative work. The existing societies, with their limited turn-over cannot even touch the fringe of agricultural indebtedness of the district.

The extent to which the co-operative movement can be said to have succeeded in solving the question of agricultural indebtedness, can only be ascertained by an enquiry into the economic condition of the inhabitants of a whole district. The average income, the total amount of debt and the causes which have led the agriculturist into a state of indebtedness, will have to be ascertained by a thorough enquiry. In Bengal, an enquiry into the economic life of

one of the districts, Faridpur, was made very recently by a member of the India Civil Service. It was found that of the population classified as agricultural, 55 per cent were free from debt and of the rest 24 per cent were in debt to the extent of one quarter of their annual income and 13 per cent were in debt to the extent one half of their annual income and 7 per cent in debt about one year's income and that the average amount of debt per head for the whole population was Rs. 11 against an average income of Rs. 52 per head. Is the co-operative movement is to solve the question of the agricultural indebtedness to any appreciable extent, we must have a much more thorough going co-operative credit organisation than we have at present. Agriculture indebtedness cannot be remedied without a due appreciation of all the contributory causes, and the moral value of co-operation lies as much in affording the necessary stimulus to thrift as in providing facilities for cheap credit. But even apart from the ascertaining the economic condition of a tract or district, it will be interesting to ascertain how far co-operative societies have relieved rural indebtedness of their own members. In Mysore, an enquiry was recently made in this direction in regard to societies which were in existence not less than four years. It was found that the total indebtedness of the members, when the societies were started was Rs. 5,54,706 and after 4 years of co-operative activity it was ascertained that this amount was Rs. 5,55,296. These figures showed that the indebtedness remained practically stationary, and it was also found that the members of the co-operative societies were indebted to a greater extent to the sow-cars than to the societies. It may be that members of the societies in this district, are in a similar position. Even apart from an economic enquiry by the Government, it is desirable that the societies should review every year, or at least at stated intervals the economic condition of their own members. It is my belief that the credit afforded by many of the existing co-operative societies is merely temporary and will have no effect on the permanent reduction of agricultural indebtedness unless a different type of society is evolved. The sow-car has a distinct advantage over the societies in arranging long term loans. These and other questions relating to the internal working of the societies in your district require examination and I am looking forward to your deliberations with interest.

THE CENTRAL BANK.

You have a Central Bank in the district and I trust that in due time it will be able to attract enough of capital and deposits to satisfy your requirements.

I am glad to know that your Central Bank is being influentially supported and I have no doubt that the directors will take full advantage of the present favourable circumstances and expand its work in all directions.

CO-OPERATIVE HOUSING SOCIETIES.

Co-operative activities may expand in regard to the housing of the poorer classes. I am looking at the question mainly from the standpoint of regeneration of the condition of the labouring classes. Measure of sanitation, public health and hygiene have no meaning, unless the subject of housing the agricultural labourers and the artizan classes is tackled, in the right spirit. In the United Kingdom Mr. Lloyd George, in one of his recent speeches announced that his main plank of reform and reconstruction was a scheme for housing the poorer classes. We, in this country are also making some progress in this direction. The Government of India have recently expressed the view that they would be willing to lend public funds to co-operative housing societies at comparatively cheap rates of interest. The question of the grant of assistance to co-operative housing societies in the Bombay Presidency for the encouragement of house building on approved sanitary lines has engaged the attention of the Bombay Government for some time. And they have now come to the conclusion that assistance should be given by the grant of State loans to co-operative societies which have for their object the provision of co-partnership tenancy of dwelling houses at moderate rents and in suitable localities for the accommodation of work-men, clerks and other classes of people, on which the present conditions in respect of house accommodation press heavily. The Madras Government have recently accepted a resolution in the Council which made a similar recommendation for State loans to co-operative housing societies and a beginning has been made in the Tanjore district, to solve the question of housing on a co-operative basis. We believe, there is plenty of scope for very useful work in the direction for us.

CATTLE-BREEDING.

Another form of co-operation is in relation to cattle and cattle breeding. Your breed of cattle is famous throughout India. Your district is near the Presidency town and you have also an additional advantage over other districts in that the Government cattle-breeding farm has been located in this district. I believe it may be worth your while to develop co-operative industries for the supply of milk products on a large scale and with your facilities for transport to Madras, this should prove remunerative. With expert advice and assistance,

your efforts to develop these agricultural industries ought to prove successful.

AGRICULTURAL AND LAND IMPROVEMENT LOANS.

I would also invite your attention to the subject of Agricultural and Land Improvement loans. It has been a matter of just complaint for years that no attempt has been made by the ryot to take full advantage of the credit facilities offered by the Government under the Agricultural Loans Act and the Land Improvement Loans Act. These Acts have been in force for over 30 years and it has been admitted that the efforts of Government in the distributions of these loans has been a failure. The elaborate and cumbrous procedure for obtaining loans has been somewhat simplified. Notwithstanding this, the total amount advanced from the Provincial funds for these purposes has practically remained stationary. This subject has been examined by the Imperial Committee on co-operation. The extent to which Co-operative Societies may be utilized in the working of these Acts was considered from many aspects. There are arguments either way. It would be a great step forward if a scheme could be devised under which Co-operative Societies can be safely constituted as agencies for the distribution of these loans to their members. The subject has been more than once discussed at the Provincial Co-operative Conference in this Presidency and last year a resolution was adopted requesting the Registrar to formulate a scheme to carry out the objects of the Land Improvement and Agriculture Loans through primary societies approved by the societies. I do not know with whether the Registrar has framed a scheme and I would suggest to you to examine the question in the light of your practical experience in the working of these Acts.

STATISTICS.

The Outlook for Silver.

In an analysis of the Silver position, the *Metal World* states that the principal causes for the stringency that has been a marked feature for a lengthy period are:—

(1) The India Government or their advisers some time back interfered with the regular trade in the metal, and prohibited imports on private account. This action was largely responsible for a high premium being placed on the value of silver, as it opened the eyes of the natives of India to the importance of hoarding the metal still further, and they refused to part with it even at advanced rates. The result of this prohibition had quite a contrary

effect to what was intended, as it raised the price of the metal all over the world instead of lowering it.

(2) China, who during the past two or three years has not possessed a superabundance of silver, now requires the metal more than any other country in the world. In fact, it is reported that very high prices have been offered to America by Chinese operators, and it is said that a shipment of Mexican coin was recently made from San Francisco to China, and that further shipments of silver are anticipated. After the sudden rise from 27d. to 37d. in 1916, China unloaded about £10,000,000 to India, on the hope of being able to replace it at lower prices later on. She found this impossible, and is thus compelled to replenish her stocks at much enhanced prices direct from San Francisco. It is more than probable that she will have to pay still higher prices for future requirements if she can get them.

(3) The high prices of commodities now general all over the world obviously require that more currency must be employed in trade, and had it not been for the high credit of England, France and America, and their mutual help to each other, silver at 60d., or even 70d., would to-day be cheap. Besides the demand for India and China, the Eastern markets, such as Africa, Mesopotamia, Persia, Palestine, etc., would have been expanded owing to the war, all will probably as soon as peace is made require even more silver currency in the shape of rupees and other coins.

(4) The surplus left over to the sellers of practically all commodities now sold at enormously inflated prices compared with those ruling before

the war has to be invested or hoarded in the article which is the least susceptible to heavy fluctuations. Gold and silver are generally used for this purpose. Commodities may come down in value in the near future, but even this is very doubtful; but whatever happens labour is bound to command high wages; and if this be so more currency will certainly be required.

(5) For many years the parity of silver to gold was in the neighbourhood of 14 to 15½ to one of gold, or, say, about 60d. per oz., and it was only after Germany demonetised silver in 1872—which action was followed by other countries—that the value of silver began to fall away. It is likely that the metal will rehabilitate itself to something approaching its former value unless the output can be greatly increased, which is unlikely although the outlook in Mexico is much better.

(6) As regards production, this is now under 200,000,000 oz. per annum, against 226,000,000 oz. a few years back, and, considering the enormous expansion of trade all the world over, coupled with the very large increase in the production of gold since 1850, silver has not increased in anything like the same proportion. Furthermore, there is no sign of new silver mines being found, and it is therefore quite likely that there will be a shortage of silver for many years to come. At the present time there is undoubtedly a shortage in all countries of the world, whether it be China, India, Russia, France, Italy, Holland, and Belgium, to say nothing of the enemy countries. These shortages will have to be made good before there will be a surplus large enough to affect the market.

IMPORTS OF COPRA AND COCONUT OIL INTO U. S. A.

The imports of copra and coconut oil into the United States for year ending 30th June, 1918, by countries of origin are given in the following table :—

From	Copra, not shredded		Coconut oil	
	Pounds	Value dols.	Pounds	Value dols.
Spain	12,300	580	...	...
British Honduras	249,478	18,275	...	...
Canada	388,842	26,119	582,159	65,000
Honduras	377,375	31,319	...	...
Nicaragua	23,400	1,876	...	...
Panama	101,385	13,344	...	...
Salvador	4,788	710	...	...
Mexico	42,938	2,571	...	...
Newfoundland and Labrador	6,770	474	...	...
Jamaica	1,563,327	121,279	...	...
Trinidad and Tobago	3,984,438	349,638	...	...
Other British West Indies	156,738	13,279	10,049	1,648
Cuba	7,588	228	...	...
Dominican Republic	514,642	31,975	...	...
Haiti	21,177	1,867	...	...
Colombia	7,562	486	...	...
British Guiana	73,783	6,525	232,690	38,165
Venezuela	6,322	213	80,555	14,106
British India	224,000	20,000	...	...
Strait Settlements	17,039,945	1,024,927	150,000	16,600
Other British East Indies	3,278,380	241,442	...	...
Dutch East Indies	45,327,117	2,445,362	39,422,251	5,016,509
Japan	7,395,480	384,925	50,256,558	6,930,654
Australia and Tasmania	96,397,324	9,104,493	2,951,647	378,825
New Zealand	3,082,402	240,586	229,065	35,308
Other British Oceania	43,124,366	2,979,641	...	...
French Oceania	20,385,019	2,576,473	389,546	63,201
German Oceania	14,554,055	856,177	...	...
Philippine Islands	219,555,171	9,949,785	154,704,481	18,229,369
Brazu	...	...	5,460	788
China	...	...	1,176,072	130,969
Hongkong	...	...	4,320	641
Total	486,996,112	26,945,569	259,194,853	30,919,783

MYSORE ECONOMIC CONFERENCE.

PROGRESS IN THE DISTRICTS.

Chitaldrug.

AGRICULTURE.

Sugar-cane Crushing Mills.—Steps were taken to stock crushing mills with Go-operative Societies for hiring them out to sugar-cane growers.

Cattle Shows.—At the instance of the President, District Committee, arrangements were made to hold Cattle Shows in every Taluk and prices in the shape of good breeding bulls costing about Rs. 150 each being awarded to the village which exhibits the largest number of cattle of the best breed.

EDUCATION.

Funds for a Library.—Mr. Papanna of Bilchode in the Jagalur Taluk has paid a contribution of Rs. 100 for starting a Library at Bilchode.

Metal Work Home Industries class.—The metal work Home Industries Class at Hosadurg which had ceased to work for some time was revived from February last.

Completion of School Buildings.—The construction of school buildings at Navall and Umblabyle was completed.

Shimoga.

AGRICULTURE.

Holding of a Cattle Show.—The Committee resolved to hold a Cattle Show at Shimoga on the 11th April, 1919, and appointed a Sub-Committee for the purpose.

Increasing the Production of Food-Stuffs.—The letter from the Secretary, Agricultural Committee, calling for the suggestions of the District Committee as to the grant of further concessions for increasing the production of food-stuffs in the State, was read, and the committee resolved to move the Government to buy 5,000 pallas of seed paddy for distribution among the people, and 20 pallas of selected seeds of Madinagiri Ragi for distribution in the Honnali and Chennagiri Taluks.

EDUCATION.

Starting of New Schools.—One Girls' School and one Panchama School were started in the Tirthahalli Taluk.

INDUSTRIES AND COMMERCE COMMITTEE.

The following is a brief report of work done by the Committee during the months of January and February 1919.

I. THE MYSORE DASARA INDUSTRIAL AND AGRICULTURAL EXHIBITION 1918.

Attention was paid to the distribution of awards and remittance of sale proceeds to the concerned parties. The report of the Exhibition was submitted to Government on 8-1-19.

II. MATCH INDUSTRY.

The proposals of the Special Forest Officer for the purchase of match-making machinery were discussed by the Committee but final recommendation is reserved pending the receipt of further information called for from the Special Forest Officer.

III. FACILITIES FOR INDUSTRIES AND TRADE IN MYSORE.

The scheme proposed by the Government to open an Industrial fund in the Bank of Mysore was considered by the Committee. As a result of discussion, the question has been referred to a Sub-Committee for sending up a workable scheme to enable this Committee to submit their final recommendations to Government.

IV. TILE FACTORIES.

(1) Mandikal Tile Factory.

The proprietor of this factory had applied for certain concessions (Viz) supply of fuel at half the seigniorage rates and free removal of clay from the Tank bed. As recommended by the Conservator of Forests, the Committee decided that no concessions could be given regarding the supply of fuel required by the factory. As regards the other concession, the sense of the Committee was that the Deputy Commissioner might look into the matter and grant the necessary concessions from year to year if he was satisfied of their real necessity.

(2) Gubbi Tile works.

Concessions prayed for by Messrs. Rudrappa and Murigappa of the Gubbi Tile works for the removal of clay, free of charge, from the bed of the Herur tank for a period of 3 years were entertained by the Committee.

V. MODERN HINDU HOTEL, KADUR.

The Committee agreed with the views of the District Committee and recommended the grant of (1) a loan of Rs. 500 for the purchase of vessels and furniture on the security of the property purchased and (2) a house rent of Rs. 25 per mensem to Mr. H. Venkata Rao for starting a Modern Hindu Hotel at Kadur.

(2) Non-vegetarian Hotel in Bangalore.

The Committee rejected the offer of Mr. E. Chin-swamy Pillai and Messrs. Shamsuddin & Co., for starting a non-vegetarian Hotel in Bangalore City assisted by Government.

VI. FLOUR MILL INDUSTRY.

The loan of Rs. 14,000 applied for by Mr. P. Subramachetty and three other merchants of Bangalore for starting Flour mill industry in Bangalore City was not recommended by the Committee who were of opinion that the Industry would not thrive in Bangalore under existing conditions.

VII. EXTENSION OF APPRENTICE COURSE.

On the recommendation of the Sub-Committee, the term of apprenticeship of the following scholarship holders was extended by the Committee for one more year from the dates noted against their names.

M. A. Narayanacharya	...	2	9	18
K. Ranga Rao	...	28	10	18
M. Abdul Rahiman	...	1	7	18
S. Rajappa	...	1	7	18
M. Abdul Satar	...	1	8	18

VIII. BUDGET ESTIMATES FOR 1919-20

The Budget estimates amounting to Rs. 30,300 for 1919-20, as against Rs. 43,100 for the current year were passed by the Committee.

IX. CONTROL OF INDIAN COTTON.

The Subject *re* the Control of Indian cotton proposed by the Board of Trade, during the reconstruction period, in order to avoid the possibility of stocks being accumulated for sale to enemy countries was discussed by the Committee in detail. The Committee endorsed the opinion of the Bombay Chamber of Commerce *re* the control of Indian cotton as a temporary measure.

P. SUB-COMMITTEES.

The proceedings of the meetings of the following sub-Committees were placed before the Committee and approved.

Name of the Sub-Committee.	Date of the meeting.
(a) Bangalore M. H. Hotel Sub-Committee	... 19-12-18
(b) Sub-Committee for the development of minor Industries	... 14-12-18
(c) Sub-Committee for the publication of bulletins	... 11-1-18

(2) The Sub-Committee to consider the questions of (1) further development of paints (2) manufacture of linseed oil and (3) manufacture of distemper met on the 4th February 19. Their recommendations will be placed before the Committee at their next meeting for opinion.

M. N. BALA RAJ URS,
Secretary.

EDUCATION COMMITTEE.

The following is a brief Report of work done by the Education Committee during February and March 1919 :—

I. SUB-COMMITTEES AND THEIR WORK.

Six Sub-committees met during the period :—

1. *Business Education*.—(Meeting held on 23rd February 1919). The synopsis prepared by Mr. K. T. Shah for the Industries and Commerce Committee was proposed to be adapted with suitable modifications by the Education Committee. The Industries and Commerce Committee has been asked for a copy of the synopsis.

2. *Moral Education*.—(Meeting held on 25th February 1919). It was resolved that certain Professors of Philosophy be asked whether they could undertake to write, in consultation with the Inspector-General of Education, the Moral Education text-books, on the lines approved by Government.

3. *Libraries*.—(Meeting held on 26th February 1919). The Sub-Committee resolved that the Public Libraries at Bangalore and Mysore be placed under the control of the Education Department. They also approved of the distribution of the allotments for the development of the two Libraries. Action was taken on the latter resolution and a communication to Government was addressed. The other recommendations of the Sub-Committee will be placed before the Education Committee to-day.

4. *Scholarships to Backward classes students*.—(Meeting held on 26th February 1919). The question of a more satisfactory distribution of the scholarships was considered. The Sub-Committee agreed to the proposal of first allotting the scholarships to the several communities and then dividing the allotted scholarships among the Districts in proportion to number of pupils in each. The recommendations will be placed before the meeting of the Education Committee to-day.

5. *Women's Education*.—(Meeting held on 27th February 1919). The Sub-Committee considered the question of making Kannada the medium of instruction in girls' institutions, the majority being of opinion that it should not be made the medium. This will be placed before the Education Committee to-day.

6. *Vocational Guidance*.—(Meeting held on 15th March 1919). Five applications for advice were disposed of. And it was resolved that the draft suggestions for developing the work in this

direction might be sent to the members for opinion. Other resolutions regarding the publication of booklets will be placed before the Committee to-day.

7. *Physical Education*.—The proposal to organize a tournament in Indian Games made by the Chairman was circulated, but the meeting was adjourned. The rules are being framed.

II. INDUSTRIAL EDUCATION.

(a) The work turned out by the Home Industries Institute and the Home Industries Classes is detailed in the appended statements. Orders of Government have been received sanctioning the transfer of the Institutes to the Industries and Commerce Department, and classes to the Education Department, with effect from 1st April 1919, and steps have been taken to hand them over to the respective Departments. Instructions have issued to the Managing Committees of the two Institutes and to the Presidents of the District Committees to arrange for the transfer and forward to this office detailed charge reports.

(b) Recommendations were made to Government in regard to the provision of Industrial Schools for gosha ladies, and Government in reply said that the Education Department had taken steps in this direction.

(c) *The Higher Tailoring Class* :—The number of pupils increased from 12 to 17, and satisfactory progress has been reported. It is gaining in popularity under the present instructor.

(d) Proposals were submitted for opening a class for teaching Leather work.

III. SPECIAL PHYSICAL CULTURE CLASS.

There are on the rolls 146 students under training in the Special Physical Culture Class. Indian games are also being regularly taught, and steps are being taken to organize a tournament at Mysore during the Birthday week in Indian games, and to award prizes, etc. to winners. The classes are very popular and appreciable progress is being made.

IV. LIBRARIES.

(a) The work of the Libraries during these months is detailed in statement No. 2 appended. Orders of Government having been received sanctioning a Librarian for the Mysore Library on a pay of Rs. 60 rising to Rs. 75, applications have been called for by notification in the Gazette.

(b) The Managing Committee of the Bangalore Public Library was reconstituted. Proposals have been received for reconstituting the Committee of the Mysore Library and these will be placed before the Education Committee to-day.

(c) Travelling Libraries are being circulated in the Taluks of Chitaldrug, Mysore and Tumkur Districts.

(d) There are already a number of villages offering to purchase these libraries permanently for their own use. Arrangements are being made to meet their request.

V. TRAINING OF TEACHERS IN MUSIC.

(a) A scheme for training teachers in music drawn up by the Chairman and approved by the Inspector-General of Education was circulated to the members.

(b) *The Music School*.—The Chairman revised the music school scheme as desired by Government and forwarded it to the Inspector General of Education for the adoption of further steps in the matter.

VI. ADULT FEMALE EDUCATION.

Further details in regard to the working of the scheme for the Education of Adult Ladies were kindly furnished by Rao Bahadur Mr. M. Shama Rao and were submitted to Government.

VII. PATRONAGE OF BOOKS.

A recommendation was made to Government for paying an honorarium to the author of "Samajadharma Kaipidi" and Government have enquired how it is intended to make use of the book.

VIII. ECONOMIC LECTURER.

Mr. H. K. Mallappa who was appointed Lecturer for both the cities of Bangalore and Mysore delivered lectures in various parts of Bangalore, on "Cottage and Home Industries," "To serve humanity is to serve God," "A half hour with Kannada Proverbs," "Adult Education and Industrial Education." In addition to the lectures, he visited certain small factories in the city of Bangalore and spoke to the people on Co-operation, Insurance, etc. A Library was also started by him. In the month of February he could not go to Mysore as he had a programme of lectures pre-arranged in Bangalore.

IX. POPULAR SCIENCE LECTURES.

The Kannada Popular Science Association was requested to suggest a programme of lectures which after its receipt will be placed before the Education Committee.

X. VISUAL INSTRUCTION.

The Committee's recommendation that the scheme may be given effect to in the District Head-quarters was approved by Government in part, only two District Head-quarters being selected for this purpose.

A recommendation was also made to Government to transfer the working of the scheme to the Education Department, which has also been approved.

XI. RELIGIOUS INSTRUCTION.

Mr. Shankaranarayana Rao to whom this subject has been allotted presided over a meeting of those interested in this branch of Education, the Secretary having been also present. The resolutions will be laid before the Education Committee.

XII. LADIES MAGAZINE.

Applications were invited by notification, for undertaking the editing of the Magazine.

XIII. PUBLIC LECTURES.

Under the auspices of the Committee two interesting public lectures, one by Mr. K. Shankaranarayana Rao, M.A., B.L., under the presidency of Sir N. G. Chandavarkar Kt. on "Some Educational Needs of the Present," and the other by Sir N. G. Chandavarkar Kt. himself under the presidency of Principal G. P. Wishard, M.A., B.Sc. on "Some Neglected Corners of Civic Conscience," were delivered on the 20th and 22nd instant respectively.

XIV. COMPILATIONS.

- (a) A revised edition of the pamphlet "Mysore Students Abroad" is under preparation.
- (b) The figures for the Development forms for all the 100 units were completed and submitted.

V. SUPRAHMANYA IYER,
Secretary.

J. S. CHAKRAVARTI,
Chairman.

The Madras Government desire to place from time to time at the disposal of the public and of the Press as accurate information as possible regarding the situation in respect of the supply of foodstuffs and kerosene oil and the measures which are being taken by the Government to relieve it. It has therefore been arranged that the Director of Civil Supplies shall in future issue a monthly review which will contain a summary of the situation and of the methods and operations by which it is being met. This monthly review will supply all necessary statistical data and explanatory notes. The first of these reviews will be issued at as early a date in the month of May as possible and will deal with the period ending 30th April 1919.

BOOKS IN BRIEF.

An Imperial obligation—Industrial Villages for partially disabled Soldiers and Sailors.—By T. H. Mawson, with an introduction by Field-Marshal Sir Douglas Haig Kt. G. C. B. G. C. V. O. K. C. I. E. and a frontispiece by Louis Raemaekers. Grant Richards Ltd., London 4s. 6d. net.

This is a charming book written in Mr. Mawson's charming style. It tackles a most important problem in a spirit which is appealing to a degree. Written during the height of the War, it sought in a thoroughly practical way to prevent anything approaching destitution among those returning maimed and broken and incapable of re-entering the field of commercial and industrial competition on the old terms. The book does not concern itself so much with the training of the disabled soldier as the creation of an environment suitable to the soldier in his new conditions. As Mr. Mawson well puts it, "if our maimed or mutilated wards are compelled to carry on their work amid the evil conditions so often existing in our towns, however, well-housed in home and workshop, instead of in the villages which it is our desire and aim to see placed at the disposal of employers of wounded soldiers as well as of those who work at independent crafts, we shall certainly have failed, as a nation and individually towards them." Mr. Mawson's book is a thoroughly suggestive one and is likely to be of great use to those who in this State are thinking of laying out industrial suburbs etc. It might be added that the book is throughout exquisitely illustrated. Raemaekers' picture of the disabled soldier adds to its interest, while Field-Marshal Sir Douglas Haig's foreword ought to make it go far indeed.

India's war Finance. By V. G. Kale M.A. Professor of History and Economics, Fergusson College, Poona. Aryabhushan Press, Poona.

Professor Kale describes in this little book how India served the Empire in the late war and how her finance and currency were constantly adjusted to suit the supreme ends in view. He also suggests the reforms now rendered imperatively necessary in the financial and economic organization of the country in the light of the experience gained during the past five years. Professor Kale writes with knowledge and precision. His clearness as an expander is seen to great advantage in some of the chapters of this book, notably those on "Retrospect and Prospect," "Taxation and Expenditure" and "Currency and Expenditure. To those who have crude

notions about reconstruction as applied to India, we would commend the last chapter of this book which we have no doubt will prick many of the bubbles that are set afloat in this connection. The book deserves to be read widely as it deals with matters of great moment to this country.

The League of Nations—its Economic Aspect.—By Hartley Withers—Oxford University Press, London and Bombay. Threepence net.

Mr. Hartley Withers—and no body is better fitted than he—gives in this pamphlet a graphic idea of the evils that will befall the civilized world if a League of Nations is not established. A League of Nations means in one word increased production and happiness to all; no League of Nations means destruction and multiplying armaments and other engines of destruction, political rivalry and warfare for world domination. As Mr. Withers says "with a greater output of goods, there would be an opportunity which Statesmanship, freed from war's nightmare by a League of Nations, might surely be able to grasp, of improving the distribution of wealth, so that the nations might rival one another, not only in the figures of their trade and the mass of their products, but in the well diffused prosperity and high standard of comfort among all classes of their citizens."

RECENT PUBLICATIONS.

Injurious Insects and useful Birds. Successful Control of Farm Pests. By F. L. Washburn. (Lippincott's Farm Manuals), $8\frac{1}{2} \times 5\frac{1}{2}$, xviii. +453 pp. Lippincott. 7s. 6d. n.

Productive Sheep Husbandry. By Walter C. Coffey. (Lippincott's Farm Manuals), $8\frac{1}{2} \times 6$, x. +479 pp. Lippincott. 10s. 6d. n.

Indian Industrial Commission, 1916-18. Report. $9 \times 6\frac{1}{4}$, 355+xviii. pp. Calcutta: Superintendent of Government Printing. Re. 1, or 1s. 6d.

The Training of Youth. By T. W. Berry. Director of Education, Rhondda. $7\frac{1}{2} \times 5\frac{1}{2}$, 207 pp. Fisher unwin. 7s. n.

The Home I Want. By Richard Reiss. $7\frac{1}{2} \times 4\frac{1}{2}$, xiv.+175 pp. Hodder and Stoughton. 2s. 6d. n.

Seed Farming in Britain. A practical treatise on the cultivation of vegetables for the production of seeds. By A. J. Macself. $7\frac{1}{2} \times 4\frac{1}{2}$, 32 pp. Burnley: Hortus Printing Co. 2s. 6d.

Firewoods. Their production and full values. By A. D. Webster. $10\frac{1}{4} \times 7\frac{1}{4}$, 95 pp. Fisher unwin. 12s. 6d. n.

War Time Control of Industry. The experiences of England. By Howard L. Gray. $7\frac{3}{4} \times 5\frac{1}{2}$, xix.+307 pp. The Macmillan Co. 10s. n.

The Development of Japan. By Kenneth Scott Latourette. $8 \times 5\frac{1}{2}$, xi+237 pp. The Macmillan Co. 8s. n.

The Century of Hope. A Sketch of Western Progress from 1815 to the Great War. By F. S. Marvin. $7\frac{3}{4} \times 5\frac{1}{2}$, vii+352 pp. Oxford: Clarendon Press, London. Milford. 6s. n.

Coal Tar Dyes and Intermediates. By E. DE Barry Barnett, Consulting Chemist, to Bagley, Mill, and Co. (Industrial Chemistry Series.) $8\frac{3}{4} \times 5\frac{3}{4}$, xvii+213 pp. Bailliere, Tindall, and Cox. 10s. 6d. n.

The Housing Problem. Its modern aspects and practical solution. By James Hartley. F. R. S. L., and Albert Winstanley, Licent. R.I.B.A. $8\frac{1}{4} \times 5\frac{1}{4}$, 152 pp. Preston: British Pictorial Press Company. 5s.

The current number of the *Bulletin of the Imperial Institute* (London: John Murry, 2s. 6d.) contains a comprehensive article on the Empire's trade in wool in its relation to the wool trade of the world. The total amount of wool produced is estimated at about 3,000 million pounds, of which almost two-fifths is contributed by British countries, Australia alone producing nearly one-fifth. Of the 460,000,000 lb. of imported wool used in Great Britain before the war more than three-quarters came from British sources. Nevertheless, as is pointed out, Germany was actually using more Australian and South African wool than England. During the three years before the war England was exporting woollen manufactures of the average annual value of 27 million pounds sterling. Since then the growth of the industry has been remarkable. The average annual value of the exports of woollen manufactures has increased to over $36\frac{1}{2}$ million pounds and at present nearly twice as much wool is being used by the weaving industry as in pre-war times and nearly the whole of it comes from within the Empire. The article includes an account of the production of wool within the Empire and in foreign countries, and full particulars are given of the trade in woollen goods of the United Kingdom, the chief European countries, the United States and Japan. The same number contains an informative article on the manufacture and industrial utilization of paper yarns, which during the war were so largely used in Germany for fabrics of various kinds owing to the scarcity of jute and cotton. The manufacture of cordage and fabrics from paper yarn has been carried on in England but it appears unlikely that any extensive development of the industry will take place there so long as ample supplies of jute are obtainable at a reasonable price. The section devoted to an account of recent investigations conducted at the Imperial Institute includes among other things a report on the value of Indian tea seed as a source of oil.

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UNIVERSITIES AND THEIR FUNCTIONS.

BY THE EDITOR.

THERE is so much interesting, so much human to dwell upon in the *Occasional Addresses* of Mr. Asquith that it would take more space than can legitimately be given to it in the pages of this *Journal* (Messrs. Macmillan & Co., 6s. net). But there are certain portions of the book which deserve to be referred to in the interests of University education in this country. These refer directly or indirectly to Education and to these we would direct special attention in this review of an eminently good book. The fountain of wisdom flows through this book pure and clear. The addresses it contains show Mr. Asquith to great advantage. Mr. Asquith's knowledge of books, it is seen, is great; but it is clear it has not diminished to any extent his knowledge of the world. Mr. Asquith's views on the subject of University Education are to be found in different addresses delivered by him during the past twenty-five years, though in one of them—the Rectorial Address delivered before the University of Glasgow in 1907—he touches on most of them. To some of the ideas he gives expression to in this address he recurs in one or two others, notably in his Rectorial address before the University of Aberdeen and in his Presidential Address delivered before the Classical Association.

In his Glasgow Address, Mr. Asquith touches on the origins of the Universities of Oxford and Cambridge and in doing so refers to one or two points to which attention may be invited here. The Mediæval Universities were, he says, cosmopolitan in composition and catholic in their range. The first of these characteristics, he illustrates in vivid terms. "There were," he says, in the Mediæval Universities "no barriers of birth or class or fortune. The door was open to all. Just as the Church was one and indivisible, speaking one language, holding one creed, observing the same rites throughout Western Europe, so, in the community of students and scholars, there was a oneness of purpose and a comradeship of speech and habit which transcended, though it did not obliterate, racial and geographical distinctions. The Scottish students, long before any University had been planted in their own soil, swarmed over Europe. They were to be found in Paris, where they had a separate College; in Padua, where they had a Nation to themselves; and in almost all the academic towns of France, Northern Germany, and of the Low Countries. Scholars flocked to Oxford in the days of William of Ockham and Roger Bacon from every part of the Western World. The University of Bologna, at the time when it held the first place among the schools of Civil and Canon Law, is said to have had no less than 20,000 students from different countries." The Scottish Universities, national as in a peculiar sense they have always been, have in their turn—Mr.

Asquith reminds—exercised the same hospitality, and have found room for outsiders to whom Providence denied the privilege of being born on Scottish soil. When Adam Smith lectured at Glasgow in the middle of the Eighteenth Century quite a third of the class were (says Mr. Asquith) Irish dissenters shut out by religious tests from their own Trinity College and his fame attracted students, not only from England, but from Geneva, and even from Russia. "A less liberal policy prevailed," adds Mr. Asquith, "in those days, not only in Dublin but in Oxford and Cambridgē, whose splendid endowments and great traditions were in danger of becoming—though they never in fact became—the exclusive property of a limited class. *Cuncti adsint* is the invitation addressed now as always, to the world of students by every University that is worthy of the name." In India, the Universities have always followed the British traditions and it is worthy of note that even in ancient days the idea of shutting out students because of their religious beliefs was unknown in this country.

Referring to the other characteristic of a University, Mr. Asquith says that the true University has been not only cosmopolitan in composition but also catholic in its range. "A University such as yours," he tells the students of Glasgow, "never was, is not, and never ought to become a technological institute for the creation and equipment of specialists. The modern student may smile at the scanty proportions of the mediæval *trivium* and *quadrivium*. He may be tempted to scoff at the pettiness and futility of many of the problems upon which in those days Angelic and Invincible Doctors broke their teeth. The Latin of the Schoolmen is no doubt an uncouth jargon which smacks more of the Vulgate and the Corpus Juris than of Cicero or Livy. Their dialectics are monotonous and infertile, not because of any defect in their reasoning powers, or indeed in their logical apparatus,

but because they were hedged in, both by authority and by ignorance, within the narrow boundaries of a single field. But whatever, within its confines, was knowable, they knew. It was said of Abelard, the forerunner of them all: *Illi patuit quicquid scibile erat*. The limits of the knowable—wherever they are to be placed—have in these days expanded so far that no ambition and no assiduity is equal to the task of taking all that lies within them for its province. Nothing can be more alien from the business of a University than to produce the shallow and fluent omniscience which has scratched the surface of many subjects, and got to the heart of none. But the fidelity of a University to the intellectual side of its mission must now, as always, be judged by the degree in which it has succeeded in enlarging and humanising the mental outlook of its students and developing the love of knowledge for its own sake." Such an ideal as this, Mr. Asquith points out, does not imply a divorce of knowledge from practice. He instances, with telling effect, the truth of this observation by referring to the work of James Watt and Adam Smith who both belonged to Glasgow University. "It is often," he adds, "at the mouths of professors, and at the hands of Universities, that the practical man learns for the first time the real meaning and the latent possibilities of his own business. Statesmen and financiers and industrialists have never received two more magnificent presents than the *Wealth of Nations* and the *Steam Engine* and both came from within the walls of the Glasgow College."

A University has the duty cast on it to leave its intellectual stamp on those whom it teaches. That, however, is not, the supreme or ultimate test of its work. "In the long run," says Mr. Asquith, "it will be judged not merely or mainly by its success in equipping its pupils to outstrip their competitors in the crafts and professions. It will not be fully judged even by the excellence

of its mental gymnastic, or its contributions to scholarship and science. It will be judged also by the influence which it is exerting upon the imagination and the character; by the ideals which it has implanted and nourished; by the new sources of faith, tenacity, aspiration, with which it has recruited and reinforced the untrained and undeveloped nature; by the degree in which it has helped to raise, to enlarge, to enrich, to complete, the true life of the man, and by and through him the corporate life of the community." Mr. Asquith reiterates the same idea in his address delivered before the University of Aberdeen (1910). Summing up, he counsels the students: "Keep always with you, wherever your course may lie, the best and most enduring gift that a University can bestow—the company of great thoughts, the inspiration of great ideals, the example of great achievements, the consolation of great failures. So equipped, you can face, without perturbation, the buffets of circumstance, the caprice of fortune, all the inscrutable vicissitudes of life." Judged by this standard, it is a question if any of the modern Indian Universities can be said to have fulfilled their true function. Mr. Asquith's conception of the function of a University was probably realised to some extent by the ancient Universities of India of which we have still a great deal to learn. The little that we do know, however, leads to the inference that they not only set up the highest ideals before their students and by and through them influenced the corporate life of the community. The uniformity in life, ideals and aspirations that we now find in India is to no small extent due to the efficiency with which the ancient Universities of India laboured in the field of education. Their modern descendants have still to discharge this the most essential part of their duty if their work is to prove of any benefit to the people of the country as a whole. In his own inimitable way, Mr. Asquith sketches out the forms of knowledge which

it is the prerogative duty of a University to keep alive. This part of his address deserves to be read by every one interested in University education. On that *vexata quaestio* the classics Vs. the sciences, what Mr. Asquith said in 1907 still holds good. The critic might say that much water has flown under the London Bridge since then, but if he serenely considers the position he will find that there is no need to strain the case for the sciences to the detriment of the classics. As Mr. Asquith puts it:—"These are some intelligences which no discipline can convert into accurately working instruments. And those which possess the capacity for being so developed vary as greatly in their structure and tendencies and are therefore as little suited to a uniform regimen, as men's bodies and characters. No one will pretend that they ought all to be treated by the same method unless he is either a quack or possessed by that indiscriminating passion for symmetry, which used to make the Minister for Education in a neighbouring country reflect with complacency that, at a particular minute of a particular hour in the day, every school boy in every school in France was being confronted with the same fact in Roman History." A little later he adds: "The claim I make for them (literary studies) covers much wider ground. The man who has studied literature, and particularly the literature of the Ancient world, as a student should, and as only a student can—I am not speaking of those to whom it has been merely a distraction or a past time—such a man possesses resources which, if he is wise, he would not barter for a king's ransom. He finds among men of like training with himself a bond of fellowship, a freemasonry of spirit and understanding, which softens the asperities and survives the conflicts of professional or political rivalry. He need never be alone, for he can, whenever he pleases, invoke the companionship of the thinkers and the poets. He is always annexing new intellectual and spiritual territory, with an

infinite of fresh possibilities without slackening his hold upon or losing his zest for the old. There is hardly a sight or a sound in nature, a passion or emotion or purpose in man, a phase of conduct, an achievement of thought, a situation in life—tragic, comic, pathetic or ironical—which is not illuminated for him by association with the imperishable words of those who have interpreted, with the vision and in the language of genius, the meaning of the world." The case for the study of literature cannot be and has not been put in a more judicious spirit. Applied to our own country, the reasoning of Mr. Asquith leads us to expect a great deal more attention from our Universities to the classics of India so that the advancement of general culture may be rendered possible in it. The study of Sanskrit by every student may not produce all that the study of the classics in England has obtained for Englishmen, but is this any reason why such a study should not be made a *sine qua non* in University education for what it can be easily demonstrated to produce? Have our Universities produced that bond of fellowship, that freemasonry of spirit and understanding that Mr. Asquith refers to? And if they have not, why have they not? Here is something to diagnose, and if possible to remedy.

To another function of the University, Mr. Asquith refers in a passage remarkable for its philosophic insight and literary charm. One cannot do better than quote the passage here. He says:—"Literature, the expression of man's feelings and thoughts, his beliefs and hopes; History, the record of his achievements and his failures; Science, the ever-growing sum of his attempts to know, by hypothesis and experiment, the external conditions which determine his sensations and circumscribe his activity—each of these seemingly isolated efforts of the human intelligence proceeds

upon presuppositions which are common to them all. But no student has got the full benefit of University teaching unless he has been led on to examine the presuppositions themselves. We say of propositions that one is true and another is false; and the tests which we are accustomed to employ as the criteria of truth—conformity to some external standard, self-consistency, adequacy as explanation, congruity with the rest of our experience—vary according to the subject matter with which the proposition deals. But upon what does the validity of any intellectual judgment finally rest? So, again, we say of an act that it is right or wrong, and there is general consensus as to the practical application of the terms. But whence is the authority of the moral imperative derived? And then there emerges, equally insistent, the larger and deeper question still: whether, in the flux of phenomena, there is discoverable by, or revealed to, man any ultimate basis of Reality? These things may not, and do not, trouble the man in the street, but they have supreme interest and urgency for those who take thought seriously. Nowhere do we stand in greater need of courage and honesty: courage, not to shirk problems by trying to believe that they do not exist; honesty in facing solutions, whatever may be their consequences. You cannot get rid of the debt which you owe to yourself and the world as a sentient and self-conscious personality—a "being of large discourse, looking before and after"—by a simple declaration of insolvency."

AGRICULTURE IN TRAVANCORE,

1917-18.

BY "RUSTICUS."

TRAVANCORE, though a prosperous and thickly populated State, is yet very little larger than a British district of average size in the adjacent Madras Presidency. It is only fair to the State that this fact should be borne in mind in dealing with the latest Report of its Agricultural Department for it makes the work accomplished by that Department all the more creditable and places the expenditure on it in its proper perspective. Rs. 57,490 which was the expenditure in 1917-18, compares very favourably indeed with the Rs. 3½ lakhs spent on the Agricultural Department in Bihar and Orissa or the Rs. 4 lakhs in Bengal and shews that the State is fully alive to the importance of agricultural development.

It is hardly an exaggeration to say that the prosperity of Travancore depends on the coconut. The products of what is undoubtedly the most useful tree in the world, providing as it does food, drink and shelter, form the bulk of its exports. It is natural, therefore, that the most important work of the Agricultural Department should be on the coconut crop. The Agricultural Chemist is endeavouring to ascertain which varieties give the best yield of copra and oil. Nuts of fourteen varieties were analysed and it was found that the number required to make up 600 pounds of copra varied from 600 to 3,200. The variation in the percentage of oil contained in the copra ranged between 50.4 and 69.1. The Entomologist is engaged in combating the insect pests which attack the coconut palm. Two of these, the rhinoceros beetle and the red palm weevil, though common, are not very serious. The coconut leaf roller, which

appeared in and round Quilon in 1917, does much more harm. Fortunately, it can be eradicated by cutting and burning affected leaves and this was done in spite of considerable opposition from the owners of the trees who apprehended the total destruction of their means of livelihood. Their fears were groundless for the trees operated on are now quite healthy and the pest has been almost entirely stamped out. The principal mycological work is a struggle against a disease affecting the roots of the coconut palm. We are not told what it is or whether, as Travancore has no mycologist of its own, the aid of the mycologists at Pusa or Coimbatore has been sought. The methods adopted in dealing with it, which are of the usual character, such as the destruction of infected trees, the segregation of isolated areas of infection, the propagation of disease resistant varieties and so on, are stated to have been successful in stopping the spread of infection. Experiments conducted at various stations show the value of manure when applied to the coconut palm. The net return from manured trees on the farm at Trivandrum amounted to two rupees per tree, the average on ordinary cultivators' lands being not more than half this. The Agricultural Department is making some progress in producing better varieties of coconut palms by hybridization. Crossing in the case of trees is a much slower process than crosses of wheat or cotton and it will be some years before the measure of success achieved can be definitely ascertained.

Of the other crops to which the Agricultural Department devoted attention, the most important were paddy, sugar-cane and tapioca. No work seems to have been done on pepper or cardamoms, though the exports of these from Travancore are far from negligible. Efforts to evolve superior strains of paddy by hybridization and crossing are being made but none of the strains produced has got beyond the trial stage. The economic planting of paddy seedlings either singly

or in twos or threes has spread so rapidly all over the State that it is no longer possible to estimate the area in which it has taken the place of the old wasteful method of planting eight to ten in a bunch. Had the Agricultural Department in Travancore nothing else to its credit, this alone would have justified its existence. The area under sugar-cane in the State is increasing and, in one taluk alone, 1,000 acres of virgin forest are being broken up for cultivation. The Department is introducing the red Mauritius cane and distributed 50,000 sets, sufficient, however, for five acres only during the year.

Stimulated thereto by the rise in the price of cloth and the difficulty in obtaining yarn from outside, the Department gave out seed of Cambodia cotton and of the improved Tinnevely varieties. This appears to us an unwise step. The Director of Agriculture is doubtful whether the climatic and soil conditions of Travancore are suitable for cotton cultivation. In any case, we cannot but regard the distribution of seed of a crop or variety before its suitability to local conditions has been thoroughly tested by the Agricultural Department as an unfortunate reversion to an old bad policy.

Travancore has a small cattle farm but the Director of Agriculture sorrowfully admits that, until the number of cattle on it increases beyond the present total of 371, no progress in the introduction of improved breeds of cattle can be expected.

There are, if we recollect correctly, few parts of India in which the proportion of literates is higher than it is in Travancore. It is, therefore, all the more surprising that agricultural education has made so little headway. All that is done at present is to teach elementary agriculture in the top three classes of the vernacular schools. The Agricultural Department is carrying on a praiseworthy work in conducting night schools for agricultural labourers belonging to

the depressed classes. There are now three of these with fifty-two students who have been given a grounding in the "three R's." We are told, however, that the progress of the schools is hampered by absence of accommodation, equipment and teachers. The only other essential which could be lacking is students! If the experiment is worth undertaking, as we consider it undoubtedly is, it is worth spending a little money on.

Travancore, like other maritime parts of India, is beginning to realize that it possesses a valuable asset in its fisheries. Two fish-breeding farms were opened at Quilon during the year and the opening of a fish-curing yard at Alleppey has been sanctioned. The work of the Fisheries Branch is only in its initial stage, but the receipts already exceed the expenditure, being Rs. 10,627 against Rs. 10,438.

The value of the co-operative movement in promoting agricultural development is being increasingly proved all over India. Travancore has, we believe, yet to start a Co-operative Department. The mention of the contemplated establishment of a co-operative society for fishermen and the establishment of few seed unions for the distribution of the seed of improved varieties of paddy are straws which show that the healthy blast of co-operation is beginning to blow across the State.

According to the South African Press, an official of the Department of Forests recently visited Johannesburg and exhibited a sample of turpentine extracted from wood in the Orange Free State. The sample seemed to stand the various tests, and inquiry is being made as to the possibilities of production on a commercial scale. A local supply is greatly needed, not only by the polish and blacking factories, which have practically had to suspend work, but also by the paint industries.

INDIGO INVESTIGATIONS AT PUSA.*

BY MR. & MRS. HOWARD,

Imperial Economic Botanists.

1—BOTANICAL.

THE investigations on this crop, referred to in previous reports, have been continued during the year and have been confined largely to Java indigo. As this crop, when grown for leaf, is in the ground for nearly a year, it must be remembered that it differs entirely from the ordinary cold weather and monsoon crops as it has to maintain itself under a very wide range as regards soil conditions. Sown in September or early October, the first portion of the growth period takes place under cold weather conditions. The crop then has to survive the hot season when dry west winds are to be expected after which the temperature of the surface soil rapidly rises. The plant then completes its first year's growth in the monsoon phase, during the latter portion of which the aeration of the soil is interfered with by the cessation of drainage due either to the rise of the rivers, the flooding of the country, the rise in the sub-soil water level or to a combination of these causes. In interpreting the results obtained with this crop, therefore, it will always be necessary to bear in mind these facts. It is generally in the second half of the monsoon and after the first cut has been taken that growth slows down and the plant often becomes diseased.

Much time has been spent in the investigation of the root system of this crop and the effect thereon of any alteration in the soil conditions and also of cutting back to varying degrees. The roots of Java indigo are exceedingly sensitive to undecayed organic matter such as oil cake, fresh *san* hemp

(*Crotalaria juncea*) weeds or partially decayed indigo, particularly when these substances are added to the soil at times when the aeration is poor. It is then possible to kill the crop outright by these means. When, however, the damage does not proceed so far, the root system is often profoundly affected, the total absorbing surface is reduced and the young roots and nodules lose their freshness and become discoloured and unhealthy. The above-ground portion ceases to grow normally, and the young branches are frequently attacked by *Psylla*. Similar results have been obtained in the August sown seed crop when the indigo has been sown in land foul with weeds which have been turned under a few weeks previous to sowing.

The effect of complete or partial cutting back on the root system of rapidly-growing Java indigo has yielded some interesting results. In the cultivation of indigo in Bihar it is the universal practice to cut the indigo back completely in June and to leave the stumps for a second crop. The time taken in forming new shoots varies with the season. In very wet weather, sprouting is delayed and the process is distinctly favoured by a break in the rains. It has frequently been observed at Pusa that if a few leaves are left at the first cut, the new growth is much more rapid. This year, the effect of complete cutting back and of hard pruning on the root system was examined. It was found that complete cutting back, while the plant is in active growth, kills the fine roots and nodules and that a new absorbing system has to be produced, before new shoots form. This naturally takes time. Heavy pruning, on the other hand, leads to far less damage to the roots and nodules, which at once explains the rapidity with which such plants form new growth. This fact may easily prove of considerable practical advantage to the indigo industry. If the crop could be grown in double lines with inter-culture, it could be heavily pruned at the

* Taken from the report for 1917-18.

first cut and the second crop could be advanced by several weeks. A new system of growing Java indigo, based on these results, has been worked out at Pusa. The crop is sown in September (after a clean fallow) in double lines with a space between for mechanical interculture to keep down weeds and to aerate the soil. The lines are pruned as early as possible after the rains break and the second cut is taken as soon as possible afterwards. Whether it will be better to be content with this second cut and then dig out the stumps or to prune a second time and try to obtain a third and final cut, is a matter which further experience will decide. The results already obtained show that under actual field conditions in the monsoon the pruned plant, grown in double lines, shoots much faster and much better than the completely cut back plant. Further, it is possible in this way to keep the land clean by bullock cultivation during the *rabi* season and the following hot weather and to reduce the labour spent in weeding. As is well known, one of the great drawbacks at the present time of Java indigo cultivation in Bihar is the difficulty and expense of keeping down weeds.

The effect on the growth of Java indigo of an alteration in the soil conditions by the addition thereto of inert aerating agents such as sand or broken bricks and tiles, was investigated by means of the modified system of pot culture described in a paper read at the Indian Science Congress at Lahore. As an example of the kind of results obtained by this method, the following measurements in the case of Java indigo may be cited:—

The effect on the growth of Java indigo of diluting Pusa soil with potsherds or sand.

Kind of soil.	No. of plants measured	Average length in cm.	Percentage increase
Soil only ...	33	36.7	0
soil $\frac{1}{2}$ + sand $\frac{1}{2}$	36	51.6	40
Soil $\frac{9}{10}$ + potsherds $\frac{1}{10}$.	33	48.3	31
Soil $\frac{7}{10}$ + potsherds $\frac{3}{10}$.	35	50.9	38

The results obtained by diluting Pusa soil have been strikingly confirmed during the year by Mr. Clouston who grew the same type of Java indigo under similar climatic conditions at two centres—on the stiff black soils at Tharsa and on the open, porous *bhata* soils at Chandkhuri near Raipur. On the well-aerated, poor *bhata* soils, Java indigo grew with great rapidity and formed good and abundant seed. On the richer but badly aerated black soils at Tharsa, the growth was very poor. These results are illustrated in a paper by Messrs. Clouston and Padmanabha Aiyer read at the Lahore meeting of the Indian Science Congress. A more effective confirmation of our views on the effect of soil aeration and drainage on the growth of Java indigo could hardly be desired. All interested in the welfare of the Bihar indigo industry should carefully study Messrs. Clouston and Aiyer's paper which is published in the Special Indian Science Congress Number of the *Agricultural Journal* of India of 1918. It will be interesting to see what class of colour will be obtained on these *bhata* soils when the Chandkhuri crop is made into indigo.

The results obtained on the production of seed of Java indigo under Bihar conditions were applied on a large scale during the year and very fine samples were obtained, much better than anything imported from Java. The yield was affected by shortage of moisture at the end of the rains and also by the dry winds during the ripening period in February which led to a good deal of loss from the splitting of the pods. For the first time since the shortage of seed of this crop became acute, the supply has been such that the price per maund has fallen very considerably, a result which will probably reduce the quantity of seed grown outside Bihar. The Pusa experiments have proved that good crops of seed can be obtained in Bihar provided the land is well selected and sufficient care is taken in the manuring, cultivation and spacing of the plants. The best

returns are obtained under conditions of garden rather than of field cultivation and it might easily pay some of the estates to devote very special attention to the seed crop on a small area and also to keep in reserve a year's supply in case of floods or unfavourable seasons. The experiments on this subject are being continued as it is expected to raise, under conditions of intensive culture, heavy yields of seed no matter what the season may be. There is little doubt that the sooner North Bihar becomes self-supporting as regards Java seed the better. As the crop is not uniform but consists of a mass of heterozygotes, differing widely in root development, it is not safe to rely on seed produced under quite different soil conditions. The result of growing seed outside Bihar might easily result in a gradual change of type which might prove quite unsuitable to the local soil conditions.

The work on the selection of Java indigo is proceeding as rapidly as circumstances permit. One of the early selections, Type 15, is being grown on the large scale on four estates. A number of others are being tested on a field scale and reserves of seed are being accumulated. Java indigo is practically self-sterile and almost all the seed is obtained by means of cross-fertilization following insect visits. These facts render selection work very difficult and the multiplication of promising types very slow as only one kind can be grown for seed each year in the Botanical Area. This difficulty has been met to some extent by facilities granted by the proprietors and manager of the Dholi estate. A small field has been lent in one of the villages of this estate for indigo seed purposes and at the present time two types can be multiplied each year.

II—BACTERIOLOGICAL.

The following are extracts from the Report of the Imperial Agricultural Bacteriologist (Mr. C. M. Hutchinson) for the year 1917-18:—

The experimental factory referred to in the previous annual report came into use at the beginning of the current year (July, 1917), and although its working was seriously handicapped by the over-maturity of the plant, many valuable and interesting observations were made during the short manufacturing season remaining. It is impossible here to give any detailed account of the results obtained which will form the subject of a full report shortly to be issued as a memoir of the Department; the following general summary will give some idea of the conclusions arrived at and of the lines of further work made necessary by the character of the results obtained.

INOCULATION WITH SPECIFIC BACTERIAL CULTURES.

In the previous year's report of the Section it was shown that good reasons existed for believing that yield of indigo in the process of manufacture depended in the first place upon the completeness of bacterial hydrolysis of the indican content of the leaf: that this was determined by the presence or absence of sufficient numbers of specific bacteria, and that variations in yield between individual factories probably depended mainly upon the character of the bacterial flora of the steeping vat, this being again determined by that of the water-supply. This contention was fully supported and the whole theory confirmed by the experiments carried out in the Pusa factory in 1917.

The main line of experiment lay in the comparison of results obtained in artificially inoculated steeping vats and in uninoculated control vats, making use of pure cultures of various hydrolyzing bacteria isolated from the *khazana*, or *seet* water, or from the walls or timbers of the steeping vats of various indigo factories. Isolation of such bacteria was effected by the use of indican agar, on which those bacterial species capable of splitting off indoxyl from indican formed indigo blue colonies, and examination of a large number of samples from

various factories has led to the general conclusion that the known yield of a factory is closely and almost directly proportional to the content of such hydrolyzing bacteria in its water-supply.

The first problem to attack was the method of inoculating the water used for steeping in such a way as to ensure the presence of sufficient numbers of the specific bacteria. It may be said at once that this problem rapidly revealed itself as the basic one of the enquiry as a whole, and its solution is still under investigation. Nevertheless the results of the comparatively limited number of experiments made in the Pusa factory conclusively established the main principle that yield of indigo depended upon bacterial action, and consequently upon the presence of adequate numbers of bacteria of the proper kind. The very first experiment in which a comparison was made between the yields of two vats, one inoculated with a pure culture of a bacterium (laboratory mark *In₁₀*) and the other untreated, gave an increase of 15 per cent in the inoculated vat, notwithstanding the unsuitability of the over-mature plant available which should have been cut for manufacture at least a month earlier. Subsequent experiments were not invariably conclusive so far as yield of indigo was concerned, but owing to the careful analytical watch, both chemical and bacteriological, kept over every stage of the process, it was not only possible to account for discrepancies but to come to definite conclusions as to the underlying causes of negative results and the feasibility or otherwise of removing them. The general procedure adopted in carrying out each experiment involved chemical examination of the plant before and after steeping, of the liquor at various stages of fermentation and also after blowing and settling, and of the indigo precipitate or *mal*, and lastly of the waste or *seet* water. Thus a close watch was kept upon the fate of the original indican content of the leaf,

and the effect of any method of treatment upon the percentage of this constituent which appeared at various stages either in its original form or as indoxyl or indigotin, was accurately ascertained. This naturally involved a very large number of analyses and as the quantitative estimation of indican, indoxyl, or indigotin is a tedious process and as each analysis was made, during the later period, both by the persulphate and isatin methods, it will be realized that the number of experiments was limited by the possible pace of output of the analytical data.

In the same way bacteriological analysis of the fermentation process was carried out for each stage of manufacture, but this analysis necessarily began with measurements of the rate of bacteria growth (by plating) in the mass cultures used for inoculation some hours before manufacture commenced, in order to discover the best conditions for securing successful inoculation. Plates were made from the mass culture after various periods of time from the original inoculation, from the *khazana* (reservoir) before and after the introduction into it of the mass culture, and at intervals up to the time of "watering" the vats, *i.e.*, running the water from the *khazana* into the steeping vats containing the cut plant. Fermentation continues after watering for varying periods of time up to some 12—15 hours, and plates were made at intervals to determine the rate of multiplication or otherwise of the specific bacteria artificially introduced with the water. The water used at Pusa was drawn directly from the river, and a large number of plates was made to ascertain the bacterial content of this water and the proportion of active hydrolyzers. This series of plates showed the very great variation in this respect which occurs in river water from day to day according to the incidence of the rainfall; immediately after rain large numbers of bacteria, derived no doubt from surface wash, appear in the river water; after 24 hours or less this extra

supply may have completely disappeared but in the meantime the character of the fermentation may be entirely changed owing to the presence of a relatively enormous number of bacteria in the steeping vat. It is a serious defect in the design of the Pusa factory that no provision exists for settling or filtration of the water so that in a large number of cases the extreme dirtiness of the water used introduced excessive numbers of bacteria of all sorts, the activities of which so far complicated the results as to make the latter of little more than negative value. Thus it will easily be realized that when endeavouring to compare an artificially inoculated vat with an uninoculated control, the existence in the water of both of a natural bacterial population already up to the limit of its capacity would inevitably reduce the artificially induced difference in bacterial content to a negligible quantity. A natural criticism immediately suggests itself; would it be practicable on a factory scale to remove any such excess of bacteria in order to make room for artificially introduced species? It may be said at once that the importance of this point was realized very early in the course of the experiments and our aim has been to find some practicable means of overcoming the difficulty.

In order to understand fully the points involved it must be realized that so far as indigo manufacture is concerned we may divide bacteria into three class:—

- (1) active hydrolyzers,
- (2) inert so far as indican is concerned, and
- (3) active destroyers either of indican or indoxyl or both.

The artificial cultures isolated at Pusa have been selected for their positive and negative virtues, *i.e.*, they are active indoxyl producers and do not destroy any large quantity of indican without hydrolyzing it to indoxyl. On the other hand a large number of the bacteria found in the dirty river

water are active indican consumers and may, even in twelve hours, destroy some 30—40 per cent of the indican present, thus reducing the yield of indigo to that extent. In addition to this positive action the competition which goes on between bacteria in any culture medium, whether natural or artificial, will seriously reduce the hydrolytic action of the beneficial bacteria if the activities of the latter are curtailed by the presence of superior numbers of the inimical species or even of otherwise inert kinds. It was found in 1917 that interference with bacterial control of the fermentation was due sometimes to excessive numbers of destructive bacteria and not infrequently to the presence in the untreated river water of a sufficiently large number of hydrolyzers to reduce the difference between the artificially produced water content of these desirable organisms and the natural one, and with it the yield of indigo, to insignificance. The frequent, but not constant, occurrence of this phenomenon provided an addition to the evidence upon which the theory underlying this work is based, namely, that the notable difference observed between the yields of individual factories can be correlated with the differences in the bacterial content of their water-supply.

Thus in the case of low yields we are confronted at the outset with a condition and not a theory, the presence of destructive and the absence of constructive bacteria, and the alteration of this condition is the object of our present research.

Two methods of attacking this problem appear to present themselves; the first and most obvious being the removal of all deleterious bacteria from the water-supply and the second, the use of artificial cultures of such quantity and vigour as to overwhelm the original population of undesirable bacteria.

It is a well-known fact that bacterial numbers in water can be greatly reduced by settling and still more so by precipitation;

mere storage in reservoirs also reduces them in quantity. Most factories use their *khazanas* or reservoirs as settling tanks, drawing off the water from the top by surface drainers; this is intended to remove suspended mud which would contaminate the indigo, but an extension of the method would undoubtedly serve to reduce the bacterial numbers, and in cases where bad fermentation sometimes followed by bad settling in the beating vat is a common experience of the factory, the use of *khazanas* of greater capacity and designed to effect more complete settling of the suspended matter in the water, would almost certainly lead to improved manufacture. Larger reservoirs would also reduce the proportion of water directly pumped without settling from the river or lake, which in many cases appears to be responsible for bad fermentation. It is a frequently observed fact that certain vats habitually give better fermentation than others in the same factory: various explanations have been given of this difference but the following one which does not seem to have been suggested appears to fit in with the conditions in many cases. In many factories the *khazana* is not large enough to supply water to all the vats in use at one time, so that a certain number of the latter are filled with water which has stood for several hours in the *khazana*, the remainder being watered by practically direct pumping from the outside source, whether river, lake, or tank. This would at once tend to create differences in the bacterial content of the steeping vats, which might very well be of a sufficiently high order to produce variations in the fermentation going on in the latter. Such variations would be reduced together with the number of bacteria by the use of *khazanas* of adequate capacity, allowing of settling the whole amount of water used each day. It is suggested that the not infrequent superiority of the yield of small factories and small vats may be traced to the very generally adequate size of their *khazanas*.

Apart from the bacteria present in the water it is to be remembered that the plant itself introduces an enormous number into the steeping vat. In the 1917 experiments it was frequently found that, whereas the uninoculated *khazana* water might contain very few hydrolyzers, yet the corresponding fermented liquor contained an abundance of this bacteria; this implied the introduction of the latter by the plant, and it may be asked how manufacture could be benefitted by purification of the *khazana* water, if the plant itself brings in so large a number of bacteria. There is reason to think, however, that this difficulty is not so serious a one as at first sight may appear, first because the bacteria generally associated with the plant do not seem to include as a rule any large number of deleterious organisms, and secondly because these bacteria, if they find the water already in possession of others, as would be the case with successfully inoculated *khazana* water, do not have time to exercise much influence upon the character of the fermentation. For this same reason beneficial plant bacteria must frequently be prevented from carrying out normal hydrolysis by the presence of unduly large numbers of detrimental organisms in the *khazana* water. The problem therefore is how far is it practicable to provide fairly clean water for steeping, and how to produce a satisfactory artificial inoculation sufficiently vigorous to overcome the destructive action of detrimental bacteria already present.

A great deal of experimental work was done to determine the best way of making a "mass" culture, *i.e.*, a pure culture of the specific bacterium sufficient in quantity to stand distribution through the 6,000 to 10,000 gallons of water in the steeping vat without undergoing too high dilution. It was found possible to make a simple culture medium of ammonium sulphate, superphosphate, wood ash and sugar, and to activate fermentation by the use of about one gallon of this culture, after six hours' incubation, in each

1,000 gallons in the steeping vat. In many cases, however, growth of the artificial inculum appeared to be interfered with, probably owing to excessive competition with other bacteria and in some instances to failure to make the proper adjustments between the temperature of the mass culture and that of the steeping water, or even to the presence of unfavourable chemical conditions in the latter, and further work must be done to find out how to secure the most favourable conditions for the multiplication and activity of the artificially introduced bacteria. In other industries depending upon controlled bacterial fermentation the use of sterilized raw material is generally adopted; this would seem to imply that the absence of other bacteria is a condition of success for the employment of pure cultures, but it does not necessarily follow in the case of indigo. Here we have in the ordinary factory working frequent cases of losses of the order of 30—40 per cent due largely to imperfect hydrolysis, partly as a consequence of the absence of the proper bacteria and partly to the presence of abnormal numbers of destructive species. It appears probable from the past season's experience that by sedimentation and the introduction of sufficient amounts of vigorous cultures of the proper species it should be possible to alter the character of the fermentation in the steeping vat so as to secure more complete hydrolysis, but a considerable amount of work must be done before it is possible to elaborate a routine method suitable for use in a factory without immediate scientific control.

HOT WATER EXTRACTION.

In the report for the previous year (1916-17) reference was made to the use of hot water extraction as a means of eliminating undesirable bacteria; a further advantage of such a method would be to secure a higher percentage of extraction of the indican in the plant; the Indigo Research Chemist has

shown that imperfect extraction in many cases leads to a loss of 30—40 per cent in ordinary factory working, and if hot water extraction could be successfully adapted to factory conditions, it should be possible to obtain a liquor not only comparatively free from bacteria (although of course not absolutely sterile) but containing a much higher percentage of the indican present in the plant from which it was derived.

With a view to obtaining information as to the possibilities of this method a hot water extraction vat was added to the factory equipment at the beginning of the current year; this consisted of a masonry vat sunk in the ground and having sloping ends and a draining platform. The water in the vat is heated with steam and the hot extract can be pumped to the steeping vats for cooling inoculation. Plant is carried into and out of the vat by a length of large mesh wire fencing net, thus obviating the trouble in handling hot material.

The experiments made with this method do not come within the scope of this year's report, but it may be said here that there appears good reason to suppose from results already obtained, that the method will allow not only of a high percentage of extraction, but of complete bacterial hydrolysis and the production of good quality indigo. It is, of course, quite possible that its use on a factory scale may prove uneconomical in view of the fuel consumption involved, but engineers whose opinion has been taken do not consider that this is likely to be the case.

THE NEED FOR AN ECONOMIC SURVEY.

BY N. GANGULI, B. Sc.

WITH the growth of civilization changes are becoming more rapid than before owing to modern discoveries in science and other causes. The nations which fail to adapt themselves to these changing conditions must fail in life's race, for the power of adjustment is the true vital power and any deficiency in this dooms us to a perpetual obscurity and subordination.

In India, owing to various circumstances, this process of adjustment has been extremely slow. But we feel sure it is gaining in impetus, and the violent impact of the outside world, instead of affecting India adversely, will inevitably rouse her from her social stagnation and economic inertia. We are now beginning to get conscious of the fact that the old order of things has ceased to exist and that world-wide relations have been established, even with the obscurest villages of India.

No doubt, there are certain advantages in the simplicity of child-life; it has its beauty and its convenience. But, all the same, when we leave it behind, the complexities of adult life cannot be forced into the clothing of childhood. The conditions of the past age in India whatever may have been their beauty and advantages, were different from those of the present time; and therefore the type of organization which characterized that age cannot wholly endure now. In former days, the cultivator was quite satisfied if he could raise his own food and clothing. Very few of the necessities of life ever had to be bought by him,—the fields and the livestock providing him with his daily wants; and therefore he had little need of communication even with his neighbours, still less with the outside world. During the time when agriculture was a self-supporting industry, rather

than a profit-making business, the fundamental character of the economic organization was its self-sufficiency and its social segregation. Each tribe, or class, produced goods for its own use only; there was no need of the medium of exchange and of any labour organization, that is to say, the economic problem of agriculture was almost absent.

But, to-day, we have come in touch with a wider world; and because that world is new, a fresh adjustment in our economic life is urgently required. Comparatively speaking, social systems and religious ideals are naturally slow to move; for any change in them means widespread dislocation, and therefore it is best that they should take time in any decision for change. But the economic pressure of the modern world is far too serious to allow slowness in our efforts towards the solution of the problems of agriculture which is the predominant factor in our economic life.

We know that some of our agricultural products form the basis of several industries, and therefore the world market is now at the door of our cultivator. It is not enough for him to consider merely what he is able to produce, he must raise crops for the world's market. The system of barter has passed away; he has to bear in mind the prices for which he can sell his crops and also the prices at which he can purchase his requirements from the world-market. Agriculture is no longer a self-supporting industry—it has to keep pace with the industrial evolution that characterises our time. It is this "Commercialization of agriculture" that calls for adjustment in relation to the socio-economic conditions of India.

The history of transition of agriculture to its modern aspect shows that while industrial evolution was making rapid progress, agricultural evolution was extremely slow in its growth. The result was that population migrated to the city and a decline of agriculture became conspicuous. Then came the discoveries of modern natural science, which

gave fresh impetus to agriculture, and thus revolutionized the art of food production. Side by side with the knowledge of increased production, "Commercilization of agriculture" began and out of this phase there emerged the modern economic problems of agriculture.

Modern agriculture is, therefore, not merely technological or scientific, it is a part of the commercial-industrial regime of the of the century and the problem that is now facing politicians and economists is how best "to organize agriculture as part of a price-regulated society" The modern farmer must know how to produce crops which will sell for more than they have cost in production: he must understand the economic forces that regulate his profit, and, in case he finds himself to be a loser, he must know how to adjust himself to conditions which he cannot control. Let us, therefore, realise that all measures of reform towards the amelioration of the condition of the Indian peasantry depend for their success upon their *economic* soundness.

In India, we are in a difficult situation. The world's commerce, with all its intricate economic forces, is impending over us: our agricultural produce is sought for by every industrial country; a well-organized modern Government is at the helm of our destiny; yet we are in no sense modern, still less our farmers. The commercial and economic movements belong, no doubt, to the twentieth century, but producers of raw materials, round which these movements organize themselves, belong to the remote past. The whole machinery of the commercial and financial world are at the service of the powerful organizations in which the Indian cultivator has no place. He labours in his farm and produces jute, cotton, wheat and oil-seeds, but the prices of these farm products are fixed in London. Thus, the farmer is continually at a disadvantage in his transactions with the well informed

commercial organizations, and he is easily exploited by captains of Industry.

Take the case of jute. The profit realised by everyone, from the country buyer up to the factory manager, is hugely disproportionate to the scanty profit realised by the grower. The jute forecasts, published by our Government, give an approximately fair estimate of the probable supply, and organized traders can conveniently speculate and fix their prices for jute.

The remedy for this state of things lies, not in appealing to the moral sense of the powerful, but in making our own position strong and secure. What we must do, if we are to resist economic exploitation, is to organize ourselves in a strong defensive line, and it is one of the functions of Agricultural economics to indicate the nature and extent of such an action.

Economic organization is the very heart of modern agriculture. All the factors of production, as well as of distribution, should be brought together in harmony under co-operative organizations. How this is to be done in our own case is a question which must necessarily come under the sphere of agricultural economics.

It is a truism to say that economic efficiency and education go hand in hand; to my mind, the problem of rural education should also be taken up by co-operative organization. It will have the double function of protecting the farmer's interest and of making him conscious of his position in the world's commerce. This consciousness will help to widen his views of life and he will realise within himself that his interests are intertwined with the whole world.

It is needless to say that the character of the social life depends upon the nature of its economic condition and most of the changes that lately have happened in our society has been brought about by our economic necessities. Therefore our economics cannot be dealt with apart from our social system.

Let me give an illustration. I came in touch with some villages where caste regulations prohibit selling vegetables. It had its meaning when different sections of the community lived upon occupations specially allotted to them, saving them from the ferocity of uncontrolled competition. But with the change of conditions these regulations have become more of the character of a hindrance than a help. When it is clearly demonstrated that the use of bone-manure gives increased yield of paddy, farmers refuse to do so for fear of losing caste. In case of a bad harvest, the deities receive a liberal supply of sacrifice, and puja is offered for increasing the productivity of the land.

Therefore, as I hinted before, those who deplore the state of our poverty should remember that economic and social forces cannot be understood as isolated phenomena. Social development is certainly a co-ordinate factor in the progress of our rural civilization, and how it has retarded its growth and what solution there may be, it is the function of agricultural economics to determine.

Now and then, a great enthusiasm to minister to the farmer's troubles prevails in responsible quarters and some palliative measures are suggested to find solutions of the problems. Some immediate cause of miseries occupies our attention, such as failure of crops, agricultural distress, labour trouble in plantations, indebtedness of Indian peasantry and such other phenomena. But what is necessary is a careful consideration of the economic issues involved in agriculture, for, whatever may be the nature of economic disturbances, they are never isolated phenomena. Therefore a comprehensive survey of the field of agricultural economics should be made before any serious work of reconstruction is undertaken. To do this, a clear conception of the character of agricultural economics has to be obtained.

II

The character of agricultural economics varies with the nature of the goal which the nation aspires to achieve. For example, Germany's chief concern has not been merely to secure a large return to the individual farmer or to obtain the greatest return upon her productive expenditures, but her ambition has been directed towards obtaining security in a crisis of war. Speaking generally, her agricultural economics has been indentured to the service of a Military State. The following quotation from a German treatise on agricultural economics will explain itself :—

Under normal circumstances the domestic agricultural production of a nation should certainly provide for the needs of the resident population as to necessary products of the soil, especially as to the indispensable foodstuffs. Otherwise the country falls into a position of greater or less dependence upon other states, which are in a position to produce more human subsistence than is needed within their own domains. This dependence is especially precarious in time of war and for such lands as, like the German Empire, are bounded on nearly all sides by other countries, and have only a very limited access to the open sea. In a war with Russia, France, England, or several of these countries together, the adequate maintenance of the home population might be seriously endangered. To be sure, the danger is somewhat lessened by a strong fleet, such as we hope to have in our possession in the course of a few years, but yet is by no means entirely removed. It remains, at any rate, an especially vital problem for German agriculture to strive to provide its domestic needs of indispensable means of subsistence, and particularly its breadstuffs. Out of regard for its own existence, even the government is compelled, so far as lies within its power, to assist agriculture in the solution of this problem.—(Translated and quoted in *Agricultural Economics* by Prof. Nourse.)

But the case of France is quite different. While the character of the German agricultural economics was being determined by mobilizing all resources for the purpose of "National strength and self-sufficiency" France devoted her attention to the individual prosperity of her farming population. It is with this object in view, that she

attempted to put into the hands of the cultivators of France the well devised scientific equipments necessary for intensive agriculture. I may quote a few lines from M. Jouzier's book, in which he points out that, after the cultivator obtains a thorough training in Science and its applications to farming,

"he is then able to practice the art of agriculture, which involves simple transformations of material by the process of cultivation, but not the industry of agriculture, which involves, at the same time and to a greater extent, the realization of an increase of wealth. And he needs moreover, in order to enable him to accomplish this double purpose, to appeal to social science, which teaches him to understand man so far as he is a social being, the needs and desires which govern him, the higher laws which he obeys in the social relationships which he forms with his fellow-men; he ought, lastly, to have recourse to rural economics in order to learn, as we have said before, to co-ordinate the action of all his industrial resources, to the end of making the greatest profit possible. But if, according to our point of view, rural economics remains the science of the internal organization of the agricultural enterprise, we shall not commit the mistake of confining it within too narrow limitations and excluding from its province all that concerns the relationships of the enterprise with the outside world It is, so to speak, the agricultural science of sciences, not because it claims a quality, but because it draws upon them all and sums them all up to speak the last word of technological science, profit."—(Translated and quoted in *Agricultural Economics* by Prof. Nourse.)

Thus, we see two distinct types of agricultural economics, one controlled by the military state, the other left to individual enterprise. Although the character of agricultural economics in India depends on the extraordinary circumstance of our close connection with a great manufacturing nation like Britain, yet the example of France stimulates our imagination. But unless we clearly understand what is really taking place in the economic aspect of Indian agriculture and collect data with scientific precision, we shall not be able to form any economic decision about our future programme.

Unfortunately, Indian economists have

shown very little practical interest in collecting data on which the principles of agricultural economics can be based. They attempt to build theories upon such premises as are foreign. It is due to the fact that they are not, in the first place, familiar with the principles of scientific agriculture, and secondly their attention is directed chiefly to the problems of Industrial economics, when questions relating to rural life become important, our economists try to elaborate, in the absence of any reliable agricultural data, from general economic doctrines, certain economic ideas which can never be applied to a rural environment. Only recently some attempts have been made to collect data from rural areas with a view to ascertain the trend of the economic process prevalent in India. It can hardly be denied that many of the results of such enquiries have not only been inadequate but fragmentary and superficial. On the other hand, we gladly acknowledge our indebtedness to Dr. H. H. Mann, of Poona Agricultural College, for organizing an economic survey of a Deccan village. This is the first attempt in this direction, and we hope that similar studies will be undertaken by other agricultural colleges; for the effort to work out a better technique of farming cannot be wholly successful unless the necessary adjustment in economic conditions is brought about.

From the economic survey referred to above, it is clear that two obstacles stand in the way of introducing improved methods of agriculture, namely, the small average size of holdings and their scattered nature. As an illustration I may refer to a case, cited by Mr. Keatinge, of a particular landlord of Ratnagiri District, owning forty-eight acres of paddy land, who had it divided up into fifty-three separate plots. Dr. Mann's survey shows that such holdings are scarcely economic. We do not know exactly the situation in other parts of India, as no serious investigation of the

extent to which holdings are divided and scattered has yet been made. An Economic survey would place all such facts before us, and we could there discuss what should be done to mitigate the evil excessive division of land.

Schools and colleges for teaching agriculture are of very recent growth in India. No suitable curriculum, specially adapted to Indian students has yet been offered, and so far as the technical courses in agriculture are concerned the institutions follow a simple standard. Be that as it may, agricultural colleges in India should offer systematic courses in agricultural economics. The task of organizing an economic survey of our rural areas rests with the administrative officers of the agricultural colleges and the state Departments, and when this is done, the students will realise the public and social aspects of our agricultural problem. I know students who are well-trained in scientific agriculture but who lack interest in the economic aspect of the subject, simply because they have been taught agriculture only from the point of view of science dissociated from the agricultural life in its completeness.

I have one more suggestion to make, before I conclude. The status of our agriculture is not exclusively the concern of farmers; it affects a very large percentage of our population. To my mind it is a matter of the highest public interest, and as such it can demand careful considerations both from the people and the Government. Is it not then a fair suggestion to make that a chair for agricultural economics should be established in every Indian university? Surely the importance of agriculture in our economic life is great enough to justify such a demand.

"MYSORE ECONOMICS."—I. PRICE OF AGRICULTURAL PRODUCTS.

BY K. SUBBA RAO, B. A.

MYSORE is mainly an agricultural country. Agriculture is the largest staple industry of the State as in other parts of India. The bulk of the people are agriculturists and depend on land for their sustenance. Therefore if the Economic condition of Mysore is to be gradually and permanently improved, the conditions of the ryots, and of the agricultural labourers should be improved, and more produce should be obtained from the land. More agricultural produce whether of food grains or commercial crops would put more money into the pockets of the ryots and more funds in the coffers of the State.

The value of agricultural products is rising immensely throughout the world and in Mysore also. No reference to the Statement of Prices published in the weekly *Gazette* for the past forty years is needed to demonstrate the phenomenal rise in prices. It is not only every school boy of Macaulay but every child in every house can testify to this rise in prices and its present *abnormal enormity*. It is not only the rise in prices that the middle-classes and the poorer people have to grapple with, but it is also the unprecedented difficulty now felt *at times* of getting articles of food for any price, much less for the prices quoted. It is true that a number of extraordinary causes and a rare combination of adverse circumstances have contributed to the present crisis in the History of Mysore and of India, nay probably of the whole world. The great European war, the like of which the history of the world has never hitherto before witnessed, the difficulties of transport owing to the shortage of wagons and engines, the necessity of exporting food-stuffs to the great theatres of

war, are the principal factors. But the most important factor is the *general shortage in food crops* all through India (and throughout the world) during the past year, owing to want of timely and copious rains. The speculative tendencies of the wealthy merchants and any combinations to purposely keep from the market available supplies, if at all, play only a very subsidiary part in this general and world-wide rise in prices. During the past twelve months the rapid increase in prices of food-stuffs has beaten outright all previous records of famine prices. One great difference between famines so called and the present situation is that in former times, when there was scarcity of wheat or rice or fodder, there was hardly any rise in prices of clothing, kerosine oil or firewood or other necessities of life. Note the price of almost every article in daily use, whether of indigenous or foreign make, has increased. Price of oil, ghee, curds, milk, of needle and thread, of paper, of chilies, of condiments, of clothing, of every imaginable article in use, has risen. Therefore even high prices for the ryots do not seem to be as effective as in days of old when the general purchasing power of the Rupee though low in regard to a few important articles of food, was relatively high in regard to other necessities of life. For the large section of people who do not get anything from the land because they do not own any, the cost of life and the cost of rents of houses have risen beyond the highest limit of their power of management. Whether you call it in the phraseology of Economics, the diminishing purchasing power of the Rupee or by any other term, the plain truth is that Rs. 100 a month or Rs. 50 a month now do not enable a man or family to get all they could for half or one-third of that sum a few years ago. It seems that on the whole the cost of existence has increased by 100 or 150 per cent, if not more.

The history of rise in prices generally shows that even the exceptional conditions

which caused the rise in prices disappear, the prices do not generally decrease to the lowest limit from which they rose.

As the war has interfered with the manufactures of the world and as it will take some time for the labour unrest in Europe to be pacified and the manufacture of machinery and implements for use on the pre-war scale, the cost of foreign manufactured goods and implements is not likely to go down very much in the near future.

It is problematical whether at any time even in the distant future the present prices will go down to the limit at which they prevailed in the pre-war period, in the normal prosperous seasons of that period.

What I wish to impress on the public is that the rise in prices is a world-wide problem and not confined to any locality. The distress owing to high prices and want of food-stuffs was begun to be felt in England and the Continent long before it was felt in India. If President Wilson and all the great allied powers of the West and the East are nobly striving for the peace of the entire habitable globe, Economists and administrators have to keep in view prominently the fact that for food production and supply, the needs of the entire world,—of the human race, has to be taken into account. If in any part of the world there is absolute want of any food grains, that want has to be supplied from other parts. Therefore if Mysore, Madras, Baroda, Hyderabad or the Northern Circars has any stock of grain, only as much as can suffice for its own people, the urgent requirements of other parts act as an almost irresistible force to offer higher prices and to transport the grain, adopting all devices which human ingenuity can conceive. Local control, Provincial control, and even imperial control, no doubt tend to regulate matters but all these are, I am afraid, not capable of literally confining the use of local articles to the locality itself.

The free and easy transport of food supply before the war has rendered the old methods of transport by carts over long distances too costly and obsolete. The habit of preserving in each family food grains sufficient for a year or two, except in the case of very rich or wealthy, has been disappearing owing to the great need for cash for urgent purchases of other articles necessary for existence, owing to want of suitable methods to preserve without deterioration food grains, owing to the prevalence of plague, and other epidemics which render hundreds of houses annually miserable. The result is a very large percentage of the people are now accustomed mostly to get their supply monthly, if not at shorter intervals. I cite this merely to show that those who raise food grains now-a-days get rid of them as quickly as possible for cash and nay few families have both the money and the convenience for storing all grains and sundries for months together at a stretch. I have heard several stories of men getting enormously rich and very poor by speculations in several trades during the war period. It is inevitable. A sudden disruption of existing economic forces and a sudden call from all parts of the world for so many items of supply necessarily introduce chances and elements of success and failure hitherto unheard of. For the future the present crisis in prices is full of lessons. The most striking of these is that *it is only an adequate supply of food grains in all parts of the world that will be a satisfactory solution of the problem* in steadying prices. Just as every country is required to maintain a certain minimum number of police and armed force to ensure internal order and ward off external aggression, every country similarly has to produce a certain minimum quantity of food grains, so that the total output may meet the bare necessities of the human race. It may be that certain parts of the world can grow only certain kinds of crops and other kinds have to be transported

from other parts. In such cases the exporting country has to grow enough for its own needs and also for transport abroad, or else the export being as important and as urgently called for as consumption within the place of production, the available stock for local consumption is depleted and the prices automatically become so exorbitant as to prevent local people from competing with any degree of success with outside demands and offers. To this must be added the inexorable trade requirements of foreign countries which require payments for exports from those countries to be made virtually in kind from the countries which import on a large scale articles of foreign manufacture. In the good old days when each little patch of country was self-contained, when exports of food grains on a large scale within India itself was not possible owing to absence of facilities and exports of food grains to foreign countries at a distance and to foreign continents were comparatively small or even unknown, the agricultural products of each place mostly remained in that area for consumption. If the seasons failed, people died by thousands on the road side. Because then transport of grain to a distance was not possible on the lines on which it obtains at present. It must be cheerfully conceded that if to-day in spite of the high prices no part of the country suffers by itself, it is due to the far greater facilities of transport. It was usual in the old days for one part of the country to have plenty while a distant part was sorely suffering from acute want. Now prosperity or adversity is spread evenly wholesale over the world. No part of the country can escape its due share of suffering, *irrespective of the quantity of food grains and commercial crops it might grow, for it has to share it with other parts.* The truth of this will be clear if I add that even now in large centres of trade food grains and necessities of life are often obtainable on better terms for the purchaser, taking quality

and largeness of available quantity into consideration than at the place of production. Therefore the importance of increasing the quantity of food grains and industrial crops side by side till we reach the maximum is very great.

The old cry of "Back to the Land" was never more imperious than it is to-day. At first the custom of each village was to produce enough for the village when the concerns of the outside world did not interfere with its internal economy. Subsequently with the growth of trade and commerce, the interests became provincial and subsequently when the entire Indian Continent became one political entity, the agricultural welfare of one part of India was felt in other parts, till at last at the present day with the hope of peace of the world, the question of food supply also is slowly but surely becoming a world-wide-problem. *Our immediate duty therefore in Mysore seems to me to be in the direction of increasing the outturn of agricultural crops in the lands under cultivation wherever it is possible and to devise all practical means to bring under cultivation lands which are not at present under the plough, but which it is possible to press into service if both capital and labour were available. And to this subject I shall refer in my next article.*

The Institute of Agricultural Botany to be established at Cambridge, England, is to be devoted chiefly to the breeding and distributing of improved varieties of Agricultural crops. Modelled after the famous Swedish plant-breeding station at Svalof, its scientific specialists will work to produce pure cultures of the new varieties, and its commercial staff will co-operate in bringing these varieties into extensive cultivation.

CO-OPERATION IN BIHAR AND ORISSA, 1917-18.

BY "VIATOR."

AN interesting addition to the latest Report of the Registrar of Co-operative Societies, Bihar and Orissa, is a map illustrating the progress of the co-operative movement in the Province. As was to be expected, the number of societies is largest in Bihar, the most thickly populated and advanced of the three Sub-Provinces. Even in Bihar, there are, however, still several sub-divisions which have less than five societies. Chota Nagpur is at present untouched by the movement, except in Ranchi and its immediate neighbourhood where mainly owing to the efforts of Catholic and Lutheran missionaries, societies are more numerous than anywhere else in Bihar and Orissa. It should be mentioned, in passing, that the supervision of the Luthern Mission Societies has now been taken over by the Anglican Bishop of Chota Nagpur and the Society for the Propagation of the Gospel, so that the fruits of the undeniably good work done by German missionaries in spreading co-operation will not be lost. In Orissa, societies are fairly numerous in the districts along the coast. Except in the west of the Sambalpur District, the remainder of the Sub-Province is coloured white in the map, which means that none of its sub-divisions has as many as five societies. This uneven distribution of societies throughout the Province bids fair to be rectified in the near future. Special propaganda work was undertaken during the year in the Tirhut and Patna Divisions and met with a considerable measure of success. The progress made in the Champaran District, where one gentleman, the Rev. J. Z. Hodge, has organized as many as forty societies is especially noteworthy.

In our last number, we reviewed the Report on the working of Co-operative Societies in Bengal in 1917-18. Certain features of the movement in 1917-18 in Bihar and Orissa strikingly resemble those in the adjacent Province. In both Provinces there was the same difficulty in regard to collections for much the same reasons. In Bengal, the percentage of collections to the total dues outstanding was 56. In Bihar and Orissa, it was even lower and only amounted to 52. For this very unsatisfactory state of affairs, it must be admitted that there was even greater excuse in Bihar and Orissa than in Bengal. The low prices of agricultural produce affected both Provinces alike but, in the case of Bihar and Orissa, sugar-cane, the one agricultural product the price of which did not fall, was damaged by floods in three districts and by an insect pest in one. Even more detrimental to the successful working of the societies were the outbreaks of disease which decimated the Province. The death rate from plague was the highest for many years, a virulent type of cholera ravaged the tracts in which co-operative societies are most numerous, whilst malaria took an exceptionally heavy toll in part of the Bhagalpur Division. In the circumstances, Mr. Mohi-ud-din Ahmad, the Officiating Registrar, is not without some justification for congratulating himself that collections were no worse.

Consolidation rather than a rapid expansion in the numbers and membership of societies or in their working capital was the order of the day in 1917-18 in Bihar and Orissa as in other Provinces. The number of societies, however, increased from 1,337 to 1,616 and of members from 56,200 to 60,778 whilst working capital rose from rather over 21½ lakhs of rupees to just under 30 lakhs. The Provincial Bank had a satisfactory year's working but its reserve fund only amounts to Rs. 11,000, which is out of all proportion to the magnitude of its transac-

tions. As regards the working of Central Banks, the Registrar deals at some length with the important question of excluding overdue interest from profits for purposes of dividend distributed. It has at last been definitely decided that such interest shall be excluded. It was evidently high time that this decision was reached for the Registrar mentions a case in which one Bank had paid large dividends for several successive years on the strength of unrealized interest on a doubtful debt of Rs. 43,000. In order to be on the safe side, the Co-operative Department in Bihar and Orissa has gone beyond the recommendations of the Committee on Co-operation and requires Central Banks to include in the return of amounts overdue, sums for which extensions have been granted. We have no doubt about the wisdom of this course, for as the Registrar points out, there is a great temptation to grant extensions in order to submit a more favourable balance sheet. Both Central Banks and primary societies were rapidly succumbing to this temptation which has now been removed. In the interests of cautious finance, there is much to be said for excluding interest earned but not due from the profits of Central Banks. On the other hand, as Mr. Mohi-ud-din Ahmad points out, if there is ultimately a default in the payment of such interest when it falls due, it goes under the head "overdue" and is excluded in the following year.

It is interesting to note that, in Bihar and Orissa, the same difficulties are found as in Bengal in forming guarantee unions in the areas in which co-operation has made most progress, owing to the unwillingness of the societies to undertake the extra risks involved at a time when they have difficulties in meeting their existing liabilities. In the newer areas, the difficulties were not so great and the total number of unions in Bihar and Orissa increased from five to twenty-three.

Of individual societies, the Catholic Mission Society at Ranchi calls for special

mention. Although the membership of this society increased only from 11,016 to 11,687, its working capital rose from Rs. 1,41,399 to Rs. 4,37,644. This was due to the large deposits received from members of the society who were also members of a labour corps, 2,000 strong, which was sent to France. The pay of these men was received by the society which made them as well as their dependents a suitable allowance out of it and kept the balance in deposit to be used on their return for the reduction of debt, the redemption of mortgaged land or the purchase of new land or of cattle. It is an excellent scheme and the members of the society have every reason to bless Father Molhant, the founder of the society, with whom it originated.

The organization of co-operative societies amongst weavers is no easier a matter in Bihar and Orissa than it is elsewhere. The weaving societies of Ranchi and Gulzarbagh were saved from extinction by orders from the Munitions Board for dosuti cloth and durries. Whether the revival of prosperity brought about by these orders will last, now that the war is over and no more of them are forthcoming, is more than doubtful. The whole future of the handloom industry is very uncertain. The Industrial Commission emphasised the intimate connexion between co-operation and the improvement of cottage industries and, if the handloom industry is to be saved, it would seem that it can only be through the influence of co-operation. But, as Mr. Donovan pointed out in reporting on his efforts on behalf of the weavers in Bengal, the obstacles are very formidable and the Co-operative Department has a very uphill struggle in front of it. Experience in Bihar and Orissa shows that the supply of pure milk through the medium of co-operative societies is another problem which is almost insoluble. Of the milk societies in Bihar, the one at Gaya had to be closed, as its members reverted to their old drinking habits. The Bhagalpur

Society worked satisfactorily but the total quantity of milk supplied during the year was only 340 maunds. The Registrar is convinced that the milk problem will only be solved by legislation, under which the cow-keepers would be evicted from municipal limits and compelled to settle in places where there would be facilities for grazing as well as for fodder growing and a "sporting chance" of sanitary conditions.

A development during the year which has great potentialities was the formation of three co-operative agricultural associations in Barh, Nawadah and Bihar. Co-operative Societies in Bihar and Orissa have been helping to introduce sugar-cane into tracts in which it has hitherto been unknown, to spread the seed of improved varieties of wheat, jute and paddy—Pusa No. 12 wheat, Kakya Bombai jute and Indrasail paddy—and to distribute manures and improved implements. The work has been done by Central Banks but as it has increased, it has been found to interfere with their more legitimate functions. In the three centres mentioned above, it has now been taken over by an organization specifically formed for the purpose. It is intended that the associations shall arrange for the supply to their members of seed, manures, implements and other agricultural requisites, shall undertake the sale of the produce raised by their members and shall assist them generally in the cultivation of their land. Mr. Mohi-uddin Ahmad lets his fancy play round a vision of what may be accomplished by co-operation in agriculture. He foresees the establishment of co-operative mills which will husk paddy, press oil, grind wheat and even, in time, make jute cloth. The articles turned out will be distinguished by a high standard of purity and so will command the best market. The bye-products such as oil-cakes and bran will remain in the locality, and will be available for manure and fodder. The shareholders in the mills will be divided into two classes, preference shareholders

who will be Zamindars and well-to-do residents of the vicinity and ordinary shareholders who will be members of co-operative societies. The profits, after the statutory allocation to reserve has been provided for, will first pay a moderate dividend to shareholders and will then be distributed in proportion to the quantity of raw material supplied. We agree with Mr. Mohi-ud-din Ahmad that there is no reason why this should remain a dream. Co-operation can do for India much, if not all, that it has done for Denmark or Ireland. But three co-operative agricultural associations, after all, represent only a very modest beginning.

Other events in what was a very important year in the history of co-operation in Bihar and Orissa were the holding of a Provincial Conference, which recommended with the approval of the Director of Public Instruction that Central Banks should be permitted to make experiments in starting primary schools, and the formation of a Co-operative Federation. The latter is modelled on the lines which have been successfully followed in the Central Provinces as was the case in the latter Provinces, the Registrar is the first Governor. It is not intended at present that the Federation should decide policy and lines of development though that is the ideal which is aimed at. It will, at the outset, provide a means by which the Registrar can ascertain the ideas and wishes of leading co-operators. It will also be able to levy a contribution from societies towards the cost of audit, in other words the principles of "no taxation without representation" will be carried into co-operation.

It is evident that the Co-operative Department in Bihar and Orissa is very much alive and that the new problems which constantly arise are being tackled with vigour and success. One regrettable feature of the movement is the attitude of the majority of the landowning classes towards it which, at the best, is apathetic and, at the worst, is hostile. They have yet to realise that such an attitude only covers them with discredit and that any increase in the prosperity of their tenants is bound to react favourably on their own.

GROWTH OF DEHYDRATION INDUSTRY.*

FOSTERED by large Government contracts, there is developing in this country a new industry that will be of material permanent benefit to our economic life. This industry is the dehydration, or drying, of vegetables. By subjecting fresh vegetables to the action of circulating currents of warm, dry air the moisture content is exhausted, with the result that the weight and bulk of the product is greatly reduced and the vegetable is made non-perishable and can be kept indefinitely. The cell structure and the flavour is not injured by the drying process; soaked in water for a few hours, the dehydrated product is restored to its original colour, bulk and food qualities, and when cooked it has the flavour and appearance of the fresh article.

A year or two ago the dehydration of vegetables in this country was practically unknown. There were one or two small plants engaged in drying berries and vegetables, but the bulk of their output was used in Alaska or other distant places, where food supplies must be light and durable. At the entrance of this country into the War, and when our soldiers began going abroad in large numbers, the War Department was confronted with the task of supplying enormous quantities of food to maintain the United States Army in France, at a time when the demands upon world shipping were the most pressing in the history of the world. To solve the food problems the various departments of the Government co-operated, and exhaustive tests were made of the different kinds of food available for export. The advisability of using dried vegetables was suggested, and a hearing on the subject was had before a sub-committee of the Senate Committee on

* With acknowledgments to the *Scientific American*.

Agriculture and Forestry, at which the food experts of the Department of Agriculture and the food commission appeared and testified as to the merits of the food. Representatives of commercial companies engaged in dehydrating vegetables were also heard, and the writer appeared before the Committee and told of his experiments conducted in California. Samples of dried vegetables were also exhibited, and hundreds of pounds of the food were distributed throughout Washington, to be tested for flavour and food values. The restaurants in the Capitol served various vegetables cooked from dehydrated stock supplied from the California plants, and scores of senators and Congressmen ate the food and were astonished at the similarity of the fresh. At the Reed Hospital, in Washington, 450 men were fed on the dried vegetables, and it was found that five pounds of dried stock supplied ample food for all. The President was even kind enough to try some dried tomatoes, which were made in soup, and many of the officials of Government tried the samples in their own homes.

CONTRACTS WITH GOVERNMENT.

As a result of these tests the War Department entered into contracts with several companies possessing the facilities for drying vegetables, and these contracts are being enlarged as the industry develops and can take care of new demands. On the Pacific Coast one organization alone now operates ten large commercial driers, employing several thousand people, and large acreages have been contracted in the vicinity of the drying plants for the growing of vegetables. Millions of pounds of dried potatoes, carrots, turnips and other varieties have already been shipped to our armies abroad, and a steady stream of the new form of food speeds across the country and the Atlantic to satisfy the appetites of our boys over there. The American Red Cross has also become a large purchaser of dried vegetables for use in its rescue work

in the devastated regions and in this country many of the large charitable institutions are becoming interested in the produce for use in their work. The big shipping companies have found dried vegetables particularly adapted for use on ocean vessels, because of the small space required for storage, and the keeping qualities and superior taste over canned goods. Scores of the finest hotels from New York to San Francisco now serve vegetables from the dehydrated stock and they report that the food is superior to that made from anything but absolutely fresh produce. Many economies can be practised by these large institutions in using these dried vegetables, because all of the labour of preparing food is eliminated. There is nothing to discard, and no cleaning or washing of the vegetables is necessary, as all of this is done at the drying plant. Dietitians of Hospitals and food experts and chiefs all unite in recommending the food.

LARGE BULK IN WATER.

When it is considered that from 65 to 85 per cent of the entire bulk and weight of green or fresh vegetables is water, and that it is the moisture that causes decay and deterioration, it is apparent that, when the dried product is used, a wonderful saving can be effected in transportation, storage and handling. One pound of dried tomatoes or cabbage is equal to twenty pounds of the fresh or canned; one pound of spinach, when dried, is the equivalent of eighteen pounds of the fresh, and so on down to potatoes, which have a ratio of one to six. One carton of dehydrated tomatoes, weighing 2½ lbs is equivalent to a case of the canned containing two dozen quart cans the whole weighing sixty pounds. Therefore, in shipping dried vegetables to our soldiers in France, the Government is able to furnish, in one shipload, as much actual food as could be carried in from fifteen to twenty shiploads of canned goods. If we went a bit further and included the weight and bulk

of the tin and wooden containers needed for the canned product, we should find a still greater saving for in every car of canned vegetables the containers alone weigh about 24,000 pounds. While the dried vegetables furnished by the government are put up in tins, they are large enough to hold about ten pounds each, and two tins thus make up a crate light enough to be handled by one man. The lightness of the dried product also permits vessels to be loaded to full cargo capacity, whereas in the case of heavy canned goods it is often true that the weight capacity of a boat is fully utilised without taking of all of the bulk.

CONVENIENCE OF THE FOOD.

The reason why so many of the hotels, hospitals and cafes are using dried vegetables is because of the convenience of the new food. The new cartoons or tins of each of the variety of vegetable can be spared in a small space and when desired for use the only work involved is to place a few handfuls in water to restore the moisture content. Where fresh produce is used, a small army of helpers is required to sort the green stock, discarding the wilted parts, tops or roots, and to wash the grift and dirt from the food. Even where the fresh vegetables are kept in refrigerated rooms, the loss through deterioration is excessive, and it is estimated that fully 50 per cent of green vegetables grown are lost before reaching the consumer.

Vegetables used for drying are grown in the immediate vicinity of the drying plants, and are allowed to reach full maturity before picking. Within an hour or so after coming from the field they are sorted and washed, after which they are carried, by endless belts, to various machines which peel, slice or otherwise prepare the vegetables for the drying trays. Wherever possible machines are used instead of hand labour, which insures absolute cleanliness and uniformity. The drying trays are taken to the drying rooms and arranged, one on top of another, with spaces on all sides, so that the warm dry air

circulating throughout the room can come in contact with the food, slowly extracting the moisture without injuring the cell structure or chemical constituents of the product. The air is not allowed to get so hot that the food will be scorched or shrivelled, and by a system of distribution the air is kept in constant circulation at a uniform temperature throughout the room. When dried, the trays are taken to the packing room, and the food immediately placed in paper cartons, lined with wax paper or in large tin cans. Thus protected, the containers can be shipped to all parts of the world and the food will not be injured by excessive heat or cold.

At the drying plants nothing is permitted to go to waste, for all tops, peelings and waste portions from vegetables are fed to stock or hogs, and even the water used for washing the vegetable is saved and the mineral salts found therein are mixed with the greens fed to hogs.

GREAT OPPORTUNITIES IN INDUSTRY.

The expansion of the Industry offers tremendous opportunities to this country. With a large commercial plant or a community plant in each locality, a new market will be offered to vegetable growers.

Thousands of acres of waste lands in the outskirts of cities, towns and villages can be utilised for the growing of vegetables, and the spaces between fruit trees in orchards can be used for the same purpose. Surplus market stocks can be taken to a near by drying plant and saved, as is done in Europe. Germany has several thousand drying plants scattered throughout the country in which are dried all surplus vegetables grown and before the war she annually dried twice as many potatoes as were grown for all purposes in this country. Her dehydrated vegetables have doubtless been one of the reasons why she has been able to withstand the food blockade of the Allies. England, Italy and France are also large users of dried vegetables, and in many communities the law requires that all fresh vegetables left over in market at the end of the day shall be taken to drying to plant. The feasibility of the new industry has been fully demonstrated, and the only thing remaining to be done to cause it rapid expansion is to educate the people to use the new form of food.

TRADE IN WASTE PAPER.

BY THE EDITOR.

THERE is so much money in waste paper that it is a matter for surprise that there should be so few people in the waste paper trade. In England, the trade in waste paper is a well organized one. In India, on the contrary, waste paper collection is still largely unknown. What is collected is mainly sent to foreign countries. The want of paper factories has led to this exportation of waste paper to foreign countries. The Government of India Paper Expert stated the other day that waste paper had been of the utmost use in the manufacture of new material during the time the war lasted. Here is what he said :—

“Let me put in a word for the manifold way in which our local paper manufacturers have dealt with the position created for them by the war. You can scarcely imagine more difficult conditions than those they were faced with. Half their supply of raw material (European wood-pulp) cut off and chemicals at anything from five to ten times their previous cost and, in some items, not procurable at all, they have literally scarped the gutters and explored the dust-bins in search of material rubbish which five years ago they would not have thought good enough to throw into their boiler furnaces, and from this they have not only made a usable paper but have kept up their output at its old figure. Knowing something of what all this means I characterise it as a notable and splendid performance. The cynic will

say it has paid them very well to do so, but I cannot admit that this in the least detracts from the merits of their effort. When they started to do it they could not know what prices were going to be and it is not they who have made prices: these have been made for them by a market which has been competing eagerly for every pound they could produce. They have done well and deserve well of the community, and owing to them our sundried bureaucrats can still deliver their souls in three lines and have the honor to be your obedient servants on a full sized sheet of foolscap and enclose it in an envelope five sizes too large for it”.

A recent writer on the *Recovery and Remanufacture of Waste Paper* says that waste paper has not been used even in England, until very recently in the manufacture of new paper. There has been considerable prejudice against its use as raw material. But this prejudice is giving way and paper manufacturers are taking to it more willingly. Before the War the American Manufacturer was the principal consumer of all British Waste paper. The Export Trade in it was a big one. Much waste paper was sent from Glasgow, London, Liverpool and the United States. Germany also exploited Britain in this particular material, as also Holland and Belgium. France also used large quantities of waste paper in the manufacture of newspaper and cheap printings, for the reason that she had to pay a high price for wood-pulp. The United States of America, however, imported the largest quantity of waste paper from Great Britain, more especially as the exportation of wood-pulp as such from Canada into the United States was prohibited by a special ordinance early in 1900. But in

Great Britain a great change came over her in this matter with the outbreak of the War in 1914. The prohibition of the export of all paper making materials soon became a necessity in view of the curtailed imports of wood-pulp. The British paper makers were thus made soon to realise the importance of waste paper as a raw material and in 1917 most of the British Mills were compelled to use all that they could get of it. The need for paper itself by the Government was found to be so great that the trade in waste paper itself soon came to be controlled. The trade in waste paper as a raw material is likely to go up in the years to come. The writer quoted above, who is a thoroughly reliable authority, says that "by the application of a systematic and scientific study of waste paper, this raw material will be used to much greater advantage than in the past."

This shows the real value of Waste paper. It is time that our people understood the utility of collecting "Waste Paper." Some idea of the extent to which waste paper has been used in England during War time may be had when it is stated that waste paper sold there during the height of the war at a price higher than that obtaining for new paper before the war. This was mainly due to the restrictions imposed on the importation of wood-pulp from the continent. A Royal Commission on paper was appointed and it controlled prices and supplies of paper. As certain kinds of waste paper (such as old account books, envelopes and letters) were found to be highly useful for munition purposes, this Commission soon evolved a system of collection of Waste paper in England, which has proved highly useful. A Chief organizer for all England was appointed and under him worked organizers for each country and these covered every mile under their charge. The organizers approached most of the local authorities and Corporations for the sale of Waste paper, the Corporation of London making a profit of £5,000 on their waste paper in

1917, and £9,000 in 1918. Some people are careful to collect their waste paper and sell it off to profit. These do not want much preaching. Some others are less careful. They have plenty to use and they do not worry about where waste goes into—into the dust-bin or the street ditch. These have to be weaned from their bad habit. The local authorities must be enabled to show a small reduction to rate-payers in the assessments, if they better dealt with the Waste. For instance, they may be induced to collect their waste and give it to the Municipal Cartman when he goes that side. The cartman should be provided with a bag to receive the same. This might be tied to the Municipal cart and taken to a central Depôt, where it may be collected and sorted and sold off to the proper parties. Then there is another class that deserves even closer attention. These are those that burn their Waste paper. These must be enabled to give their waste to people who may be trusted to destroy them in their presence in such a manner as to make it impossible for any one to know or use their contents. The Municipalities can in this way add to their income by helping in the collecting, sorting, grading and sale of waste paper. This is a matter worthy of close attention.

These are various uses to which Waste Paper can be put. Besides the manufacture of new paper from it, there are other uses to which it can and it has been put for ages past. For instance, what is known as papier-mache is made essentially from waste paper. This is really a light, durable substance made from Waste paper pulp or sheets of waste paper pasted together and variously treated with chemicals, heat and pressure. It is largely used for ornamental trays, boxes, light furniture, etc., in which it is varnished and decorated to resemble Lacquer work. It is also used for architectural decoration, in which it is made to imitate plaster moulding. The manufacture of papier-mache, it may be added, was

learned by Europeans from Eastern nations, Persia, Japan and India have long been familiar with it. America has adopted papier-mache to use for railroad wheels, etc. Vegetable parchment waste has been used for the production of Oxalic Acid. Waxed papers are treated for the recovery of pulp and wax separately. The United States Bureau of Paper Standards (Technologic Paper No. 87) treats of the manner in which these kinds of paper should be dealt with. Waste paper of certain kinds imported into Japan are used in house construction there. White and coloured shavings are used largely for packing articles of a fragile nature. Waste paper in largest pieces is used for packing furniture and hardware.

Though some of the above uses for which waste paper has been put to cannot be avoided, the need for putting it to a more scientific use is coming to be recognised. In the years to come this use is likely to supersede all other uses to which it has been put in the past.

The part to be played by paper in reconstruction work in Northern France and Belgium is described in an article in the *New York Sun*. Ideas taken from the Germans and extension of present uses by American and British manufacturers are being combined. The work is going forward rapidly despite the shortage in wood pulp and its products. Waterproof paste-board houses, easily handled and put together are probably the most important development. Such dwellings have oiled paper in place of glass windows. Screws made of wood-pulp are used in putting the houses together. Tables, chairs, and other pieces of furniture are being made of paper. Even kitchen utensils are so constructed. Ease of transportation, due to the enormous saving weight, as well as the ease of replacement, are the chief factors that are making paper a universal material of reconstruction days. Tin canisters are being replaced rapidly by paper containers. Paper buckets are more

durable than galvanised iron or wood. Some other uses being made of paper are the following:—Garages, fire-proof by a special process; harness and saddlery; driving belts for machinery and roofing tiles. Paper cloths, counterpaints, bed-guilts, and blankets were made in Germany during the later period of the War to off-set the efficacious British blockade. Some of the ships which carry the paper made material to the stricken nations will be equipped with paper life-boats. This contribution comes from the Japanese who do not only thoroughly waterproof the Boats but are enabled by a process of cementing to build them strong and serviceable.

Since paper making in Mysore is being talked of as a practical proposition, it behoves us to save as much as possible of our waste paper, as its reversion into paper is one of the easiest and most economical ways of manufacturing paper.

It is now proposed to make use of fallen leaves to supply the lack of raw material for paper. On March 22nd, M. Edmond Perrier of the French Academy of Sciences presented before that body on account of the successful experiments along this line of research. The process is very simple, rapid and inexpensive; the leaves are first crushed, which reduces the blade to powder, which is carefully separated from the ribs and veins. It is the latter which form the raw material for paper pulp. They are subjected to a somewhat rapid leaching and are then washed and bleached, after which the pulp is ready for use. The leaf powder is usable in various ways. According to a recent estimate by the Director of the School Orignon, France produces annually between thirty-five and forty million tons of dead leaves. It is calculated that only four million tons would be required to furnish the paper pulp required in an average year. The economic importance of the question is evident from the fact that in 1913 France paid \$ 20,000,000 for the paper pulp imported from the Central Powers.

ECONOMICS IN THE WEST.

India and the East.

London, 20th March, 1919.—It is remarkable how small is the realization here of the industrial position which is being created in India by force of circumstances and the natural development of the energies of the population. At the Coal Commission, now sitting here in circumstances of momentous import for the future of British industry, we have heard much of the possibility of American and German competition with British coal in outside markets but very little indeed of the Indian factor which in days to come must be a highly important and even decisive one in some spheres in which home produced coal was formerly supreme. Much the same thing has happened at the Peace Conference. There has been interminable talk about establishing a uniform system of labour legislation and having a common understanding as to hours and wages, but scarcely a thought has been given to India and the East where the conditions of life and industry are so absolutely different as to make anything like a uniform world labour code an impossibility. It is true that in the semi-official report of the proceedings of the Committee of the Peace Conference which has had the matter in hand as a sort of after-thought we are told that "it is not expected that Oriental countries like India and Japan can be brought to accept European conditions which their climate and social arrangements make inapplicable" and the pious belief is added that even these countries will make improvements *pari passu* with those made in Western countries "so that the conditions of international competition as between East and West would not be altered to the serious detriment of the latter;" but this comment only serves to show how very superficial has been the thought given to this immensely

difficult problem of the reconciliation of Eastern practice with Western industrial ideas.

In the main it is no doubt true that as industry extends in the East a levelling up process is at work tending to reduce the disparity between Eastern and Western rates of pay and hours of labour. Moreover, there is a greater disposition to accept the principles upon which factory legislation is based. But making every allowance for the effect of these influences, there still remains a great gulf to bridge before there can be anything like equality of practice. That "the East is East and West is West" is in no respect truer than it is of the habit of thought in the matter of industry. The minute and complicated code of regulations which is accepted as a part of the ordinary routine without trouble in the Potteries District would not work for a single day in the Bengal factories. No sane Indian manufacturer would dream of accepting the trammels and heavy financial obligations of the arrangements to which British employers and employees accept as a part of the system. But the widest difference is in the matter of pay. Some English workmen earn in a day as much as Indian artisans receive in a month for their labour. Let me tell a story to illustrate the point. A friend of mine the other day was doing business with a member of a great iron manufacturing firm in the North. Said my friend: "I suppose some of your workmen earn as much as £5 a week?" "Five pound a week!" exclaimed the manufacturer. "do you know that only last week we paid out to six men £65?" It will take a long time I fancy to level up Indian rates to this level. And for my part I cannot see why Indians should make any particular effort to bring about parity of conditions. They are starting their industries and naturally cannot hope to succeed under conditions which govern long established enterprises in the West. They must proceed continuously and

sacrifice no advantage which they derive from their natural circumstances if they are to compete on even terms with the highly organized and intensely energetic industrial concerns of Europe and America. On the whole I am disposed to think that the International Labour Covenant will not have much effect in the East if, indeed, it proves anywhere anything more than a bundle of amiable aspirations.

DEVELOPMENT OF ELECTRIC WELDING.

Since the war ended we have been hearing a good deal about the wonders accomplished in various departments of applied science with the help of recent inventions. Take electric welding as an example. By means of this process something like miracles were worked or what at all events a few years ago would have been regarded as miracles. When the Germans damaged the engines of their ships in New York harbour so as to render them useless for the Allies, they thought that they had put them out of gear to such an extent as to prevent their employment for years. But the United States Naval construction department by means of welding were able to restore something like thirty ships to service without the casting of a single cylinder. The majority of steel tyres and rims used by the Army Transport Department during the war were electrically welded, one firm alone supplying approximately two million rims of this character. In the construction of locomotive boilers and tanks in the United States in 1918, it is estimated by a competent authority that the saving in metal alone owing to the adoption of electric welding amounted to £600,000. In the future we may expect that this method of construction will be more and more used in industry, more especially in the engineering and ship-building establishments where it has already proved its worth. It is satisfactory to know that we have achievements such as this development of electric welding to set against

the record of official muddling revealed in the Chepstow shipyards.

DEVELOPMENT OF CIVIL AVIATION.

Arrangements are steadily proceeding for the development of civil aviation under the friendly ægis of the Government. In this connection General Seely made quite a remarkable Parliamentary statement at the end of last week. The minister for aviation sketched in a fascinating way the possibilities of the future and lifted the curtain on what is being officially done to meet the demands of the Peace Age. While he was cautious in estimating the rate of progress that the science will make he distinctly outlined a wonderful picture of enterprise. Aerodromes being established on the Cape to Cairo route, a mail route to India *via* Cairo virtually settled and measures for the linking up of the Empire by aviation—these are some of the features of an epoch-making speech. In regard to construction, General Seely made some interesting revelations. Apparently we have on the stocks either near completion or in an active stage of construction, new types of aeroplanes which are expected to do very remarkable things and not least in the matter of speed. On the whole it is believed that in aviation we are distinctly taking the lead and there is a very confident expectation that with the advantage which we derive from the possession of the control of the principal air routes of the world we shall be able to maintain it. The one obscurity in an otherwise clear and admirable exposition related to the bridging of the Atlantic. Concerning this the air minister was distinctly vague. Doubtless we shall wake up one morning to find that some venturesome spirit or spirits has flown across the ocean and brought New York into two days reach of London. Whether the flight will be from the West to the East or from the East to the West is an interesting matter for speculation. The chances are in the favour of American crossing as the wind and weather conditions favour this direction for the flight.

SOME INDUSTRIAL BY-PRODUCTS.

How immensely valuable are some of the by-products of industry has been demonstrated over and over again during the war. One of the most interesting revelations of this character was made recently at the Society of Arts when Mr. Edward de Segundo read a paper on the "Removal of the Residual Fibres from Cotton Seed" and their value for non-textile purposes. In the lecture room was installed one of the machines invented by Mr. Segundo for removing residual fibre from Indian cotton seed, and the lecturer explained lucidly the system by which the residual short fibre which escaped the gin or other saw linting machines was made available for various purposes. Thousands of tons, Mr. Segundo stated, had already been employed in the manufacture of explosives, paper, artificial silk and other cellulose derivatives. In illustration of the infinite variety and the valuable character of the uses to which the material may be put he exhibited samples of cotton seed flour, loaves of bread made with a mixture of cotton seed flour and wheat flour and paper, artificial silk and vulcanized fibre. As over 95 per cent of the 11,000,000 tons of cotton seed produced annually is of the woolly type there is clearly a wide range for this new industry. Mr. Segundo dealt in an interesting fashion with the possibilities of his invention as concerns the Indian trade. Pointing out that by defibrating and decorticating woolly cotton seed instead of crushing it whole a higher return per ton of seed was obtained in the cotton seed oil industry he stated that there were other advantages in denuding the seed of its woolly covering. The defibrated seed would command a premium above the price ruling for the undefibrated. The cost of freight from India to British markets would be lower, due to the closer bulking of the defibrated seed. The risk of seed heating on the voyage would be minimised and consequently the danger of fire. Mr. Segundo went on to say that consider-

able additional revenue per ton original weight of seed shipped from India to British markets would be derived by defibrating the seed in India before shipment. The products obtainable from the available quantity of cotton seed in an average crop in India, if wholly employed in the production of oil and cake, and if the residual fibres were turned to account, ought to be worth on the basis of pre-war values and after deduction of all manufacturing expenses, about £7 per ton of seed compared with £3 per ton, the estimated value of the seed previously under similar conditions. This represented a potential increase in revenue of about £6,000,000. It hardly needs to be added that if this invention of Mr. Segundo is in any respect equal to the character claimed for it it will revolutionise cotton planting especially in India which is peculiarly adopted for the employment of the new system.

The British margarine industry is one of the most important industrial by-products of the war. Before the outbreak of hostilities the home market was almost entirely dependent upon foreign; chiefly German, Dutch agencies for its supplies of this valuable domestic product. These alien firms thought their interests were best served by sending their supplies to Germany rather than to England with the result that our Government was driven to establishing factories under its own supervision and control for the manufacture of margarine. Possessing the control of supplies as the authorities did they were able to ensure a continuous supply of raw material for the establishments. Soon the public were being furnished with excellent margarine at reasonable cost, a most valuable advantage in view of the great scarcity of butter all over Europe. Now the supplies are larger than the domestic demand and exports are being made to central countries. There seems little reason to doubt that the margarine industry has come to stay. It will probably prove an important factor in imperial development and help to remove the reproach which has long rested upon British industry that it allowed staple raw material produced within the Empire to become the practical monopoly of foreigners.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Over Six Million Automobiles in the United States.

Washington, D. C., U. S. A., April 12, 1919.—A canvass covering every state in the country brings the information that on January 1, 1919, a total of 6,225,192, automobiles and motor trucks were registered and in use in the United States—an expansion of 73 per cent in two years.

When one stops to calculate the investment represented in 6,000,000 motor vehicles he is amazed at its immensity. The average cost to the purchaser of the trucks and cars now on the roads of America was easily \$1,000, so that there is here an investment of \$6,225,192,000, and only a few years ago the horseless carriage was a curiosity, and there were even a considerable number of people who believed that it would never be a success!

It is a fair presumption that the mileage of these cars will average 5,000 a year, or over 30,000,000,000, miles every twelve month. It is also safe to say that the expenditures for tires, gasoline and repairs will average seven cents a mile or \$2,100,000,000 yearly for maintenance and cost of operation. This waives all consideration of the very vital element of depreciation.

The field of the motor vehicle in the United States is constantly and rapidly broadening. An output of 1,500,000 cars—or perhaps 2,000,000—a year for several years to come is not an extravagant prediction—in fact is considered a conservative estimate. If the whole country had an automobile "density" equal to that of the state of Iowa there would be over 16,000,000 cars on the road to-day.

The automobile is here to stay. The luxury of yesterday becomes the necessity of to-day. It is permanently woven into our

social and economical fabric. As the old car lags behind in condition, style and popularity, a new and better one must take its place—expense purely incidental!

Thus it is that Automobile stocks are fast growing in investment popularity. Only the preface of the motor car romance has been written.

WOOLWORTH, THE 5 AND 10 CENT WIZARD, DIES.

Frank W. Woolworth, who started a 5 and 10 cent store in the town of Utica, New York, forty years ago, on a borrowed capital of \$50, and eventually became the multi-millionaire proprietor of a great chain of these stores in the United States, England and Canada, has died.

In addition to establishing a business with profits which exceed \$8,000,000 yearly, Mr. Woolworth built the celebrated fifty-one story Woolworth building, on lower Broadway New York City, said to be the tallest building in the world.

Woolworth's life reads like a romance. He was born of very poor parents on a farm in the interior of New York state, on April 13, 1852. Until he was twenty-one years old he worked on his father's farm, obtaining a very meager education by attending school at nights, and later attended a business college. His first "job" was as an errand boy in a dry goods store, and he was gradually advanced until he became a clerk and salesman, during which time he married while he was earning but \$8.50 per week. He worked six years in the dry goods business in various stores before a successful bargain-counter sale gave him the idea of the possibilities of making substantial profits from nickel and dime purchases.

His idea was broached to his employers, who termed it "visionary and foolish," and he was advised to stick to the old-fashioned plan of conducting a store. Nevertheless, Woolworth was determined to test his plan, and his first venture was in the town of

Utica in the year 1879. He secured of friends \$50 in cash and gave his personal note for the goods. In twelve months he had paid off his debt and saved some money. Closing out his store in Utica he located in a small city in Pennsylvania, and there he established not only a store, but the foundation of his fortune.

His rapid rise from a small "pigeon hole" store to the palatial Woolworth building on Broadway, New York—with more than eight hundred branch stores in the United States, sixty in Canada and England—forms one of the most fascinating and interesting business romances in the history of the world. The business was incorporated several years ago for \$65,000,000.

In addition to being president of F. W. Woolworth & Co., he was a director in a number of banks and business enterprises. He maintained a splendid residence of Fifth Avenue, New York, noted for its rare paintings and works of art from every part of the world, also a country home at Glen Cove, Long Island, on the Atlantic Ocean.

UNITED STATES NOW A CREDITOR NATION.

With 30 per cent of the wealth of the entire world jingling in the capacious pockets of his striped trousers, Uncle Sam fingers over the I. O. U.'s for many millions of dollars which he has but recently received from other world-powers, and, like a good sport gifted with shrewd business sense, waves his hand overseas and says: "I'll take it out in trade—come, show me what you have got to sell."

Changed from a debtor to a creditor nation during the nightmare of war, the United States realizes that if it ever wants to have the account squared it must take foreign goods in payment; if it wants to indulge the Yankee propensity for trading it must realize that there are two halves in foreign trade—give and take—selling something abroad, which is exporting, and buying return cargoes, which is importing.

American financial authorities, aided and abetted by the financial leaders of the country, are easing the way for development of both branches of foreign trade—exporting and importing.

Restrictions on foreign exchange transactions have been lifted by the Federal Reserve Board, and still others imposed by reason of war conditions are to be raised as soon as compatible with the best interests of the country. The united advice of the State Department, the Federal Reserve Board, and the War Trade Board and the cable and postal censors has raised restrictions affecting foreign exchange, foreign trade, and commercial and financial cables and communications. Great Britain, Canada and France are acting coincidentally with the United States in these matters.

U. S. GASOLINE PRODUCTION MAKES MARVELLOUS RECORD.

The story of the speeding up the production of gasoline is one of the most interesting and perhaps one of the most amazing of the entire war period. A special report on this phase of the response of America to the war call for materials by the United States Bureau of Mines is highly informing. It quotes the remark of a British admiral, who said, "We floated to victory on a wave of oil," and then proceeds to give the series of figures that confirm the view that the war was in great part brought to an end by the immense supply of gasoline furnished by this country.

In 1916, before the United States entered the war, according to the statement referred to, the production of gasoline was a little short of fifty million barrels annually. In 1917, when war activity was accelerated by the entry of the United States into the conflict, the production of gasoline had increased to nearly 68,000,000 barrels—an increase of more than 50,000 barrels a day. Many thought this was the peak of American gasoline production, but in 1918, when all war

problems had assumed greater proportions, the output of gasoline in this country exceeded 86,000,000 barrels—an increase for the year of more than 17,000,000 barrels. The daily increase for this year over the record-breaking year of 1917 was about 47,000 barrels for each of the 365 days, or almost as much more as the increase of the previous year.

How this country sent over an ever-increasing flood of gasoline to the allies and to friendly countries is seen in the export figures. In 1916 there were 8,743,102 barrels of gasoline sent abroad. In 1917, this amount had reached 9,901,877 barrels, an increase of about 4,000 barrels a day. In 1918, these exports had reached a total of 13,312,508 barrels, an increase of nearly 10,000 barrels a day over the year 1917.

It is the opinion of the Bureau of Mines that no single industry in this country of so important a nature ever made such a showing in a single year.

A NATION-WIDE ESTABLISHMENT.

Uncle Sam is smiling happily these days, while he is running the biggest manufacturing establishment in the history of the world—a factory spread out over forty-eight states and taking orders from all over the world. The nations are sending here their raw materials and getting them transformed by American genius into food, clothing, tools, and the thousand and one requisites, aids and luxuries that advancing civilization has taught the people of the world an ambition to have and to use.

This situation mightily pleases Uncle Sam, for he appreciates that in this way the wealth of the world is being multiplied. There is a direct increase in value from the raw materials to the finished, manufactured product, and that represents the talent and technical skill of his workers. It represents their advancement in making something better out of what is taken from nature's store house.

But Uncle Sam is not content with merely running the world's factory. He is also sending to all lands the agricultural products from the best cultivated lands in the world, and is preparing to facilitate such supplying of the hungry of the world from his surplus crops. From the United States Bureau of Markets a number of agricultural trade commissioners are now proceeding overseas as permanent representatives to report on conditions and to study the marketing and distributing of American farm products of all kinds. Heretofore the United States has done little in the way of economic study of the demands and methods in foreign countries, and yet in 1913, a representative year, our agricultural exports amounted to \$1,904,000,000—or 45 per cent of the total exports of this country.

MAKING THE FARMER'S CAR EARN ITS COST AND KEEP.

"She is running fine," remarks the farmer to his foreman, pointing with satisfaction to his automobile, in which he had just returned from a long trip.

"That is good," replied the farmer, "because there is a lot to do to-day."

"What is the programme for to-day?" inquires the farmer.

"Well, first we have to saw about fifty fence posts for that new pasture; then there are about a hundred bushels of corn to shell and some feed to grind, and if there is time we ought to pump a little more water into the tank. And we must not forget to make the butter that is to go to market in the morning."

The circular saw is stationed near the woodshed, and the lumber is piled up by its side. The farmer backs his automobile up a short distance from the saw. The foreman pushes an iron framework with a cross shaft of steel, having a fixed pulley at each end and a moveable pulley in the middle, under the rear axle of the automobile. Then he pushes down the cross-bar of the tilted frame. This lifts the

rear wheels off the ground, and when the cross bar reaches the ground the rear axle of the car slides down the inclined brace of the frame, until the tires of the rear wheels come to rest against the two eight-inch drive pulleys at the ends of the shaft. The drive belt of the circular saw is slung around the pulley in the middle of the shaft, the proper adjustment is made, and a few minutes later the buzz saw, driven by the car wheels, is cutting through the logs.

And so the corn was shelled, the water pumped, and the butter churned, all with the help of the automobile.

SOLDERING BY ELECTRICITY.

Simple soldering jobs, such as splicing wires, fastening cable leads to terminal clips, or sweating metal plates together may be quickly and neatly done with the newly-invented electric soldering tongs.

The parts to be soldered are brought almost instantly to the correct heat, which is not at all possible with the ordinary soldering copper.

Two spring brass strips, 10 inches long $2\frac{1}{2}$ inches wide, and at least one-sixteenth of an inch thick, are used to carry the electric current to the carbon electrodes as well as to form the tong handles. Form two brass clips of such dimensions that they will hold, each, a piece of carbon 1 by 1 inch by $\frac{1}{2}$ inch thick. Rivet them to the end of the brass strips; a good job of rivetting must be done, and the clips must seat snugly against the strips so that a good electrical connection is assured. Saw a block of fibre $1\frac{1}{2}$ by 2 inches by $1\frac{1}{2}$ inches thick. Drill small holes in the free ends of the strips so that the latter may be screwed to the fibre block, parallel and insulated from each other. Provide electric wire connections to the brass strips.

These tongs must be operated from a low-voltage circuit, and for most shops the storage battery will best meet this requirement. For temperature regulation during soldering a variable resistance or rheostat should be used to decrease or increase the flow of current. To solder, it is only necessary to grasp the piece or pieces to be worked on between the carbon electrodes by using the device exactly like a pair of tongs. The instant an electric current is established between the carbons the latter should come to a red heat, and the soldering process is but the work of a few moments.

If it is desired, the brass strips may be wrapped with friction tape for convenience and safety in laying the tongs down. It is not necessary for protecting the hands if the rheostat is wound non-inductively.

TINTING PHOTOGRAPHS WITHOUT SPECIAL COLORING MATTER.

Rural scenes, landscapes, sunsets, etc., appear to beautiful effect in a photograph which is tinted to an even pink. Yellow gives a most pleasing effect for some prints, as do also purple and red. The latter is especially appropriate for fireside interior scenes.

In order to obtain these tints, expose gas-light paper in the usual way, develop and then wash off the developer completely—be sure that it is washed completely from the print—then dry the prints in the dark room without fixing. Even an amateur photographer will understand the process well. When the prints are dry, expose them to the sun's rays until a tint is obtained considerably deeper than that which is wanted. Then proceed to fix the print in the usual way. Such prints are as permanent as those made in the ordinary way, as has been demonstrated.

Another method preferred by some is to use gaslight paper and print in the sun. Expose until the whole image is a dark purple. Immerse it in an ordinary fixing bath, which will at once tone and fix it. The color of prints made in this way is yellow, orange, pink, red or purple, according to how long the print was exposed to the sun. In both these methods good results can be obtained readily after some experimenting and trials.

ELECTRICAL ATTACHMENT FOR OIL AUTO LAMPS.

A patent has just been issued for an oil automobile lamp which can be converted into an electrical lamp without alteration by installing in it a handy attachment now perfected and on the market. The adapter consists of a socket for an 18 volt bulb mounted on the end of a curved wire that springs into the front flange of the lamp, holding the bulb suspended in the centre of the latter. The electric cord is strung through one of the vents in the base of the lamp and is not conspicuous.

ALFRED T. MARKS.

NOTES.

The following particulars relative to developments in Castor Oil Production in Spain are published in the *Board of Trade Journal*:—The preliminaries for the foundation of a new company to plant the "ticino" (*palma christi*) in Spain, and to produce castor oil, has just been completed. At Malaga, Velez Malaga, and Jerez de la Frontera, experiments have been made with good results in the cultivation of "palma christi." The blooms measured up to forty centimetres and the plant reached a height of from two to three metres after sixteen to eighteen months. This demonstrates, it is stated, that Andalucia is very suitable for its exploitation. The plant grows freely in the Spanish Zone of Morocco, but up to the present it has not been exported. Being a quick-growing plant a corresponding quick return can be expected from its plantation, and it would be of great profit to the native farmer if he could be induced to sow the plant. If sown in January the plant should produce two and sometimes three crops in good years. In winter the shoots have to be cut at the height of two hands from the ground, and they sprout again the following year. The crops of the second and third year are larger than those of the first year, and after three years the plants have to be renewed. The shoots and leaves are composed of long and strong fibres, and can be used for making paper. The pith of the plant, the lightest of all existing plants can be used for life saving materials. The trade in the seed and oil of "palma christi," the producing country of which is chiefly British India, is at the present time of considerable importance. The average importation of the oil into Europe from 1905 to 1916 was 5,513,000 litres per annum, valued at £113,646 and the average exportation of the seed from British India was 92,844,520

kilos, valued at £1,280,404. It is not possible to ascertain exactly the quantity of "palma christi" seed imported into Spain, because the Customs statistics include all oleaginous seeds. The imports of oleaginous seeds into Spain in 1914 were valued at 291,401,860 pesetas (£1,165,634). The kilo of "palma christi" oil which, before the war, was sold at pesets 1'25 (1s.), now costs pesetas 10 (8s.). In view of the large increase in consumption, it is unlikely that the price will return immediately to the 1913 figure.

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We take the following from the Report on the Administration of the Central Provinces and Berar for the year 1917-18:—During the period under report an increased stringency was introduced in the grant of certificates of approval and in the scrutiny of the manner in which concessions are worked. A certain degree of laxity, which was perhaps permissible when the mining industry was in its infancy in these Provinces, is now out of place, and the attention of the Administration and its officers has been constantly directed towards obtaining the business-like exploitation of minerals. The two chief minerals in the Provinces are coal and manganese. The production of the former rose from 287,832 tons in 1916 to 371,905 tons in 1907. The figures for 1918 are not yet available. In 1917, 482,961 tons of manganese were produced. The former industry was stimulated by the difficulties of transport of Bengal coal and prices have latterly been ruling extremely high. The opening of the Ghugus field in the Chanda district in capable hands promises largely to increase the provincial output. In the manganese industry the higher rate of sea freights absorbed much of the extra price obtained, and though the larger and better organized mines did well, the smaller ones are reported to have profited little by the high prices. An important change of policy was decided on during 1918. The levy of royalty has hitherto been based on

the c.i.f. rate in the British market. As fluctuations in the rates of freight make it difficult to calculate the royalty, a Bombay f. o. b. rate, which happens to work fairly also for Calcutta, has been adopted. For minor miners, which are not governed by the Mining Rules, a system of consolidated acreage rates to cover all payments to Government has been adopted. Complicated accounts both on the part of concessionaires and Government are thereby avoided.

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The United States Consul at Teheran in a report to the Department of Commerce at Washington, says that a Chamber of Commerce, under the auspices and with the financial support of the Persian Government, has been organized in Teheran. The constitution, which has been approved by the cabinet, provides that the Chamber shall not consist of less than six nor more than eighteen members, one-half the number to be appointed by the Minister of Commerce and one-half elected by the merchants of the city. Provision is made for the organization of Sub-Chambers in the several cities of Persia, and steps have already been taken to that end. It will be the duty of the Chamber of Commerce to make investigations and report to the cabinet on subjects coming under the following headings: Questions relating to banks and banking, stock exchanges, commercial tribunals, transportation of merchandise, commercial expositions, trade extension, concessions, laws and regulations relating to business, customs tariff, prohibition and restriction of imports and exports, trade conditions, bureaus of commercial information, and commission merchants and brokers. The writer has interviewed the various members of the Chamber, and he has been informed in each instance that one of the principal reasons for its organization is the desire of Persians in all walks of life to strengthen and extend commercial relations with the United States. With this object in view, the Chamber desires to receive American

trade publications and catalogues. Address "Chamber of Commerce, Teheran, Persia." A reading room will be maintained, where the same will be available for those interested.

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According to the Annual Report on the Forest Administration in Ajmer-Merwara for the year 1917-18, the following experiments were carried out during the year:—
(1) *The Bitter Cassava*.—Cuttings from Travancore were received in the beginning of September 1917, and planted in Mohwabag nursery, where it is doing quite well so far. The *sweet cassava* was again tried at Pushkar, where it is doing excellently. Both these varieties will now be re-transplanted from cuttings from our present stock. (2) *Spineless opuntia*.—Is doing well at Pushkar and Sendra nurseries. They will be again transplanted now. (3) *Cassia auriculata*.—Twenty maunds of seeds of *cassia auriculata* were supplied to the Conservator of Forests, Eastern Circle, United Provinces, for Rs. 246, and a good deal of its seeds will be sown in Ajmer and Beawar forests. Its seeds have already been sown in Ajmer, Srinagar, Danta, Beawar and Sendra nurseries, where the plants are doing well, and they will be transplanted into forests at the beginning of the rains. (4) Lac from peepul trees were twice tried on Dhak trees but both times it was a failure. It is now intended to get its seeds from Dhak trees growing in a dry climate like Ajmer and then plant it on local trees.

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An Agricultural engineer points out that there will shortly be a need for many motor-ploughs, or light direct ploughs, capable of ploughing from six to seven inches deep, and which can be handled easily in small fields, and are, as far as possible, "fool proof." Owing to the weak monsoon, there are in India now thousands of acres absolutely bare and devoid of a blade of grass or a grain of corn, and consequently it is extremely difficult to keep bullocks alive. Prices had

already risen sky high before famine conditions were felt, and it is anticipated that before next ploughing season commences—which will be about the end of next month—about 50 per cent of the bullocks, which in ordinary circumstances would have been employed for ploughing, will have died. As a result, it is feared that there will be practically no bullocks left to haul the ploughs. The alternative is mechanical cultivation, and as there are several firms in England which have already placed on the market motor-ploughs which are suitable for conditions in the East, and, of course, in India, it is to be hoped that they will take the matter into their hands, and will not allow American and Japanese firms to establish themselves in the Eastern markets practically without competition.

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The British Government, have placed a fund of a million sterling at the disposal of the Research Department to enable it to encourage the industries and to undertake research. Much will depend upon the way in which this money is spent. The independence and initiative of the British manufacturer have contributed largely in the past to his success. After the war he will need all possible assistance in undertaking and developing research work as a means of enlarging his output and improving its quality. But if the help is to be effective, it must increase his independence and initiative. The Advisory Council for Scientific and Industrial Research have therefore recommended, after consultations with manufacturers and others, that the new fund should be expended on a co-operative basis in the form of liberal contribution by the department towards the income raised by voluntary associations of manufacturers established for the purpose of research. The fund for each industry will be expended by a committee or board appointed by the contributing firms in that industry, and the results obtained will

be available for the benefit of the contributing firms.

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The sixth meeting of the Industries Section of the Board of Industries, was held on the 26th April, 1919, at Benares. The Board disposed of a reference from Government regarding an amendment to the Indian Explosives Rules, 1914. The desirability of starting a school for the training of ex-soliders in motor driving and in the working of oil and steam engines was discussed. The question of the appointment of a glass expert for these provinces was considered and a recommendation to fill the post now vacant owing to the departure of the later Expert, Mr. Elland, is going forward. The Board was pleased to note that a carpentry School has been started at Allahabad, from the 1st April, 1919.

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Information has been received from His Majesty's Government that the Allied and Associated Governments have decided that after midnight of April 28th all Black Lists of firms and persons which they have published or compiled shall be withdrawn and that all disabilities attaching to trade and communication with firms or persons on such lists shall cease to operate.

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The fifth meeting of the Education Section of the Board of Industries was held on 30th April, 1919, at Bareilly. Amongst other matters which came before the Board, the proposal to appoint a whole time principal for the Dyeing School, Cawnpore, was adopted. A scheme for the establishment of a leather working school at Meerut was also submitted and approved. Mr. M. A. Aziz's application for an extension of his scholarship of Rs. 75 a month granted to him in 1917, for the study of vegetable oils at the Indian Institute of Science, Bangalore, was disposed of and the Board decided to recommend it to Government.

GLEANINGS.

The following letter dated Darjeeling, the 18th April, 1919, has been sent by the Secretary to the Government of Bengal, Revenue Department, Forest Branch, to the Secretary of the Bengal Chamber of Commerce:—"I am directed to forward herewith, for the information of the Bengal Chamber of Commerce, a notice regarding a proposal for the execution of an agreement with Messrs. Andrew Yule and Company, Managing Agents, India Paper Pulp Company, Limited, granting them for the period of twenty-one years the right to extract bamboo, from the Kesalong Forest Reserve in the Chitaldrug Hill Tracts Division. The notice is published in the newspapers." The notice referred to, dated Darjeeling, April 18, is as follows:—"A proposal has been made to the Government of Bengal that they should enter into an agreement with Messrs. Andrew Yule and Company, Managing Agents, India Paper Pulp Company, Limited, granting them for the twenty-one years the right to extract bamboos for the manufacture of paper pulp from the Kesalong Forest Reserve in the Chittagong Hill Tracts Division at certain concession rates. Any objection to this proposal should be communicated to the Revenue Secretary to the Government of Bengal on or before the 3rd May, 1919, when they will be taken into consideration."

A sample of Egyptian rice straw has been tested containing moisture, 11.8; ash, 17.7; cellulose, 50 per cent. The length of the ultimate fibers was 0.6—3.0 mm.; mostly 0.9—1.3 mm. On digestion for four hours at 140°C with 14 per cent of caustic soda the yield of dry pulp was 44 per cent; with 10 per cent of soda, 50 per cent; and with 8 per cent of soda, 52 per cent all expressed as dry pulp on air dry straw. These pulps

all bleached easily to a pale cream colour, almost white. On digestion for 12 hours at 140°C with 20 per cent of lime, the straw yielded 56 per cent of yellow straw pulp suitable for boards and brown papers. The above experiments showed that a good bleaching pulp could be obtained with an unusually small consumption of soda, but this advantage is partly counterbalanced by losses in the recovery of soda from a material containing such a large proportion of silica.

Further information with regard to the formation of a new paper pulp company in Algiers is given in the *Board of Trade Journal*. The company is called the "Société des Celluloses de l'Afrique du Nord," with a capital of three million francs, and it has been formed by the Société Nord Africain d'Etudes, 23bis, Boulevard Carnot. The object of the company is to manufacture paper pulp, paper, cardboard, etc., from esparto grass and other raw materials obtainable in the colony. We are not moving forward fast enough in this matter of Mill in Mysore.

It is announced for general information that the following instructions for the issue of licenses for the export of mica have been issued to Collectors of Customs:—

- (1) Exports of mica of all descriptions are permitted under license to the United Kingdom, as at present.
- (2) Exports of all sizes and qualities of mica splittings and block, other than first and second qualities of clear and slightly stained ruby block of all sizes, are permitted under license direct to other British and to allied destinations.

TOPICS FROM ECONOMIC PERIODICALS.

AGRICULTURAL EDUCATION.

Materials for a Policy of Agricultural Education.

Writing in the *Agricultural Journal of India* for January 1919, Mr. H. M. Leake, M.A., F.L.S., (Economic Botanist to the Government and Principal, Agricultural College, Cawnpore) says:—

Myself when young did eagerly frequent
Doctor and Saint and heard great Argument.
About it and about ; but evermore
Came out by the same Door as in I went.

In perusing the voluminous literature, which has arisen on subjects educational, the quotation which heads this paper comes somewhat forcibly to the mind. I am not oblivious to the retort that this statement obviously raises, namely, why then add to that volume? I have failed to find an answer which satisfied myself, and am fain to admit that it is probably of the same tenor as that to the riddle of our childhood—the riddle I do not remember, but the answer was to the effect that the other donkey did so too. There are certain thoughts, however—perhaps, more suitably termed criticisms—which so constantly arise in such perusals that I am tempted to assume the *role* of the other donkey and commence with a few general observations which will lead on to the more special subject of agricultural education.

In all educational institutions, we have two factors—the pupil and the teacher; the former, owing to the system of teaching in classes a multiple, the latter a single, intelligence. This condition too often offers the mental equivalent of a boat's crew. In training a crew for a race the coach has to think of the crew as a whole and attempt to raise the average physical fitness to the highest point on the day of the race. For this purpose, certain members will be over-trained or "stale" others under-trained. The system, of training, consisting as it does, or did in my own college days, of combined exercise in the boat, and individual exercise, known technically as swinging, affords a certain amount of latitude in adapting this system to the individual capacities of the oarsmen. Add to this the fact that the rowing age is an age of discretion, where the oarsman is capable of interpreting his own feelings

and expressing them to the coach, and it becomes clear that the training for a race is a system interpreted by a coach, or teacher, who is aided and checked by the intelligence of the individual members of his crew. The similarity of the conditions of the teacher with his class, to those of the coach with his crew, is sufficiently near to mask the essential and great differences, and this similarity is emphasized by the examination system which fixes a culminating point for the education. For, just as the crew is judged by the result of the race, and as the coach attempts to have his crew in the pink of condition on the day the race is rowed, so the teacher attempts to have his class so mentally equipped on the day of the examination that it will show to the best advantage. To do this he, too, adopts a system and, to the extent that the class system, by which the pupils are distributed to him, and the examination system, by which he and his pupils are judged, become standardized, that system also becomes standardized, and impersonal,

The force of the comparison, however, lies not so much in the points of similarity as in the differences, and this aspect will repay a brief consideration. The crew is judged by its combined effort which is the resultant of the individual efficiencies of the members of the crew. In the case of the examination, on the other hand, there is no combined effort—the individual efficiencies are interdependent, and the teacher will be judged differently according as major stress is laid on the average number of passes or on the standard attained by the most intelligent pupils. This difference may be expressed in another way. While the judge at the winning post of the boat race has no personal influence on the result of the race, and, through it, on the coach and the system of training, the judge in the examination, in other words, the examiner, according as he frames his questions and considers the answers to test the general standard of the class or to pick out the best pupils, will have a material influence on the teacher and his system of teaching. Of the former type, the examinations, as conducted in this country, are perhaps the most typical examples, while, of the latter, the scholarship examinations, as conducted at the older English Universities, afford a good illustration. The former appear to be the sounder, in that it will aim at the maintenance of an average standard of the combined teaching, within the understanding of all the students, about which individual exercises, adapted to the individual intelligences, can be built. The latter type of examination forces the standard of the combined teaching to the level of the highest intelligence—too far above the level of the weaker intellects for any system of individual exercise to be of value.

Again, I have stated the members of the crew have reached an age of discretion. They are in a position to judge by their feelings their physical fitness; they can convey those feelings to the coach who can modify the individual training accordingly. The pupil is in no such enviable position. He is not a judge of his own mental condition and the teacher is, thus, to this extent at a disadvantage, when compared with the coach, that he has to interpret his instruction in terms, not of his own intelligence, but of that of his pupils. This to my mind is a point rarely realized and realized with the utmost difficulty. Again and again I have listened to reasoned and logical arguments on courses of instruction, the reason and logic of which, however, appeals to the adult mind, and I have found it impossible to avoid wondering, as I listened, whether the speaker had not assumed in his pupils, a mind as logical and as accustomed to reasoning as his own. The danger is, in fact, very real that, in evolving a system which is reasoned and logical, the teacher is evolving one which, by that very fact that it is reasoned and logical, will appeal to the adult and not the pupil mind. He has, in fact, failed in one of the main functions of a teacher, and he lacks the capacity of projecting himself into the position of the pupil.

There is yet a third difference in the comparison I have drawn. The coach's efforts are concentrated on the race and on turning out his crew on the day in a condition as near physical perfection as possible. It is no concern of his if, on the evening after the race, the stroke dines not wisely but too well, and is later arrested for obstructing the police; nor does he care if another member of the crew spends the rest of the day smoking till he becomes ill. The teacher is in a totally different position with his pupil. He does not, or should not, lose interest in his pupil on the day the examination result is published, though this is perhaps too frequently the case. A teacher who does this is not worthy of the post, and it is only necessary to consider one of the objects of education, and that is, to render the individual a useful citizen, to make this clear. Education has missed one of its main functions if it will not prevent the man who successfully passes the final examination from developing into a pick-pocket.

By the above comparison, I have attempted to bring into prominence one aspect of the educational problem, and one which is frequently overlooked, namely the insignificance of the system compared with the individual. My statement that this aspect is overlooked may be called in question, and it is true that recognition is frequently accorded to the point. I cannot help thinking, on the other hand,

that in this country, as in others, in the distribution of educational finance and in the grants lavished by Government for educational development, which are largely ear-marked as non-recurring and are devoted to the erection of new school buildings, too much attention is given to the numbers of schools teaching a standard curriculum, and too little to that improvement of the pay and prospects of the teachers, which alone will attract a better class to the profession, and thus remove the necessity for that rigid standardization which stultifies the individual initiative—so essential to the real education—of the teacher.

The above considerations are of general application; that is they apply to the educational problems of any country, but from this point, my argument proceeds along two lines, and deals more particularly with the problem as it appears in this country. The first of these deals with the type of education, as influenced by the conditions of the country, the second with the limitations imposed by the system of educational finance.

One of the functions of education has been already stated, namely, to render the individual a useful citizen. That may be highly materialistic aspect, but the modern world is materialistic and a country, if it is not to be left behind in the international race, must be materialistic. It is difficult, if not impossible, to find a brief definition, which will cover each and every function of education, and the above will, perhaps, serve as well as any for a starting point. Now it is obvious that the world would not be a satisfactory place to live in, if everyone were educated to the clerical profession. The clerk is a useful person, but once the number exceeds that necessary to carry on the essential clerical work, there must be a number of persons who are failing to fulfil that function. It may be that there is here a confusion between education and training, but I think not, though I admit the line of demarcation between the two is not readily drawn. Education then, considered from a national aspect, must be diverse, and, in its practical aspect, consists in placing before the youth of the country the essentials for the development of the mind in a form which will leave the individual in a condition in which he will render useful service as a citizen. In former times the guiding factor in the choice of a profession was mainly parentage, the son following the trade of the father, and this is still very largely the case, especially in more backward countries. But modern thought—the result of compulsory education—is increasingly in favour of equality of chance, irrespective of birth. Within wide limits, therefore, the diversity of education should be so disposed as to place within reach of each individual

a form of education suited to his probable future life. A more detailed consideration of the true meaning of this statement is desirable, since it is here, I think, that the fallacy contained in the modern claim for equality of chance, and in the various economic doctrines arising therefrom, is most readily exposed.

In the various professions by which the individual earns a livelihood, the labour expended is rewarded in very different measure in the apportionment of worldly goods, and, with the materialistic aspect of modern life, the professions tend to be judged by this standard and to be desirable in proportion to the measure of these goods received. Equality of chance in practice, therefore, implies a claim on the part of every individual to an education fitting him for the most lucrative profession. Now it is perfectly clear that the world would not be a fit place to live in if every individual were educated for the legal profession. Food and the thousand necessities of modern life have to be produced by human labour, and for that labour the education I have taken, as an example, is unsuited. Equality of chance, therefore, is not obtainable by the provision of an education, qualifying for the most lucrative fields of employment. The alternative, the equalising of the reward, while perhaps not theoretically unsound, is practically unattainable. It is only necessary to attempt to picture the economic condition of a country in which the farm labourer receives, say Rs. 1,000 per mensem (a) to understand how far we are from obtaining equality of chance by this means. The fact is such equality is an ideal, probably undesirable and, certainly, practically unobtainable. Labour of the brain always has been, and will continue to be, more liberally rewarded than labour of the hands, though change may occur in the degree of divergence. Equality of chance is, thus, a fallacy; nevertheless the idea has an underlying basis of truth. That truth is, I think, this: while, for the majority, it is desirable that an education shall be provided which will fit them to fill the station they are most likely to occupy in life, namely, that into which they are born, modern thought demands and rightly demands, that the individual should not be bound by the accident of birth. Far from this meaning that each individual has a claim to the highest form of education, it implies that a ladder should exist by which individual has a claim to the

highest form of education, it implies that a ladder should exist by which individuals in any particular station can ascend, if so fitted, to a higher one. Advancement is, thus, not an inherent right, but the reward of merit. One error running through educational discussions and educational schemes is the misplacement of these two objects of education—the conversion of the ladder provided for the gifted to a broad staircase for the mediocre. The effect of this error is to be seen in most countries, but in none, perhaps more so than in this. The average individual is led to expect, regardless of economic laws, an education fitting him for a station into which he was not born and, in after life, a remunerative field in that station. The inevitable result is disillusion: the source of half the social unrest in this and most advancing countries.

I think we have now reached a stage in the argument which will enable us to provide a truer view of educational aim. It is that the main, and major, educational object should be to provide an education which will leave the individual a useful citizen in the sphere in which he was born. The educational ideal, contained in the above, is to inculcate in each individual that habit which is briefly and succinctly given in the catechismal saying: "to learn and labour truly to get my own living and to do my duty in that stage of life into which it shall please God to call me. (a)" It may be argued that that attitude is incompatible with ambition, the desire to ascend, but I think not. That desire may exist alongside the ready acceptance of the fact of failure. But while I insist that this ideal should form the main object of educational policy. I am equally certain that the object will only be completed by the provision of what has been termed a ladder, but a ladder so hedged about that only those suitably-equipped may ascend.

If the arguments adduced are sound, it follows that in any country the type of education most commonly found, should be adapted to fit individuals for the occupation most commonly practised, and it

(a) "To do your work honestly, to die when your time comes and go hence with as clean a breast as may be—may these be all yours and ours by God's will. Let us be content with our status, telling the truth as far as may be, filling not a very lofty, but a manly and honourable part."

In turning over the pages of Thackeray's "Essays and Reviews" during an idle half hour, I have, since this article went to the Press, chanced to light on the passage above quoted. It is one which would be hard to equal as a definition of the educational ideal.

(a) The same condition will be reached by assuming the High Court Judge to be paid Rs. 7 per mensem, the essential fact being the relation between cost of production and purchasing capacity—that is, relative and not absolute values.

is only necessary to glance at the figures to appreciate how far education in this country is from the ideal I have outlined.

In the United Provinces "two-thirds of the population are supported by Agriculture, and there is no single occupation which supports one-tenth of this number of the people." In actual figures these are divisible into the following main classes:—

Zemindars, non-cultivating	...	500,000
" cultivating	...	3,000,000
Tenants with some occupancy rights.	10,500,000	
" " no occupancy rights	...	10,250,000
Sub-Tenants	...	2,000,000
Labourers	...	4,500,000
Total		30,750,000

While the latter two roughly constitute a class whose standard of living is such that the children have to begin to take a share in the family labours at a very early age, and for whom, therefore, the simplest primary education is all that can be provided, a very large proportion of the remainder occupy a position, such that the children are not compelled to earn a livelihood till the age of 17 or even later, and for whom it is desirable, both on individual and communistic grounds to provide an education, fulfilling the conditions I have laid down. I have said on individual and communistic grounds—individual, because the world's progressing is affecting agriculture equally with other occupations, and that man will succeed best who most clearly appreciates this progress and most quickly profits by new markets opened to him; communistic, because sound development of a community is only obtained by equality in the rate of educational progress of its several component parts, the unsoundest form of development being that where a small minority progresses, while the bulk of the population stagnates.

There is thus a large community, probably larger than any other single community of the Province, in a position to benefit by a suitable form of Agricultural education. This state may be compared with the educational facilities provided, and in doing so, care must be taken to distinguish between teaching agriculture, and education fitting the student to return to the land. The point need hardly be laboured: the literary nature of the mass of the secondary education, unfitting the student for practical work of any nature; the location of the schools in urban surroundings, accustoming the student to a social life he cannot obtain at his home, and replacing the healthy outdoor life of the individual by the artificial sports of the playground—of which, though a true admirer, I recognise the

limitations which include a dependence on companions for the supply of his physical recreations—are too well-known to require further development. It is true attempts have been made to introduce agriculture into the school curriculum. These, however, come to grief from failure to distinguish between teaching agriculture and supplying an education suiting the pupil to return to the land. It is ~~not~~ to realise that the student truly from an agricultural stock knows a great deal about practical agriculture, usually a good deal more than the master provided under such conditions to teach it, and such attempts as have been made hitherto to rectify the educational deficiencies indicated, have failed from this cause.

On the first line of my argument, therefore, we have arrived at the conclusion that the present educational system totally fails to satisfy the needs of the largest single element, if not the major portion, of the community. It is true that there is an Agricultural College, but that is a coping stone without the underlying structure. Moreover, the position of a College will be more clearly understood when the second line of argument, has been developed.

Educational effort, like every form of endeavour, is limited by financial considerations. The necessary funds are obtained in a variety of ways. In many cases, as in the older Universities and Public Schools of England, the funds arise from endowments, a system well illustrated by the munificent gifts which have been made for education in the United States. In others, of which the primary educational institutions of England and a large proportion of those of this country are examples, the funds are provided by Government. In the former case the trustees are the sole arbiters in any questions as to the disposal of the available funds, and the primary consideration is the degree to which the founders' terms are complied with. In these cases, there is no question of a financial return, the trust is complete with the fulfilment of the conditions imposed. Where, however, the funds are provided by Government the position is different. Government is merely in the position of trustee for the country, and it is its duty to see that the country receives the fullest measure of return for the expenditure involved. It is no part of my argument to justify the expenditure of public funds on education, that is generally admitted; my concern is with the measure of the return received, with relative, rather than with absolute, values. There can be little doubt of the relative value of the two classes of education; that which, on the average, fits a man for full development in that station in which he lives and has his being, and that which compels him to seek among fresh fields and pastures new to him, his means of livelihood. The former is a process of gradual evolution of the individual

which allows for development owing to the gradual interaction between the individual and his surroundings; the latter partakes of the nature of thrusting hot glass into cold water, a process ending usually in the destruction of the glass vessel.

The true error in the educational system of this country, as I conceive it, lies in the fact that it has hitherto developed along lines which render it unsuited for the largest single element, if not for the major portion, of the population. This is no complaint that the educational facilities are excessive, but it is a very definite statement that the fullest measure is not being obtained for the funds expended. This is not merely based on negative considerations implying merely a waste of funds, such would be the case, if the schools and colleges were filled by the sons of the clerical learned professions; it implies more than this, the expenditure of funds on directions actively harmful; for, by failing to provide an education fitting the son of the land-holder to remain on the land, the system drives such persons into a line of life for which they are unfitted, and in entering which they become as the hot glass to cold water. What is needed, and urgently needed, is the development of a form of education which will leave the average country youth fitted for life in the surroundings in which he is born; there is ample scope in such surroundings for the educated mind to find full and useful employment and to fulfil the *role* of a useful citizen which we have laid down to be one of the main functions of education.

It is open to argument that I am here labouring to prove a point, the importance of which is already sufficiently recognised. In part that is true; the recent conferences on agricultural education, the first held two years ago at Pusa, and the second last year at Simla, indicate this. The "memorandum showing what has been or is being done to impart agricultural education to the sons of cultivators," published in connection with the report of the last conference, however, shows that a relatively small amount of effort has been devoted to this aspect of education. Nor is my main object to supply this proof. I am tempted to think the difficulty has lain not so much in the recognition of the fact as in the recognition of what constitutes a suitable form of education. The arguments, I have hitherto adduced may incidentally prove this point, but that proof is only incidental. Their main advantage lies in the fact that they provide a point of view which will, I think, help to point a way to a solution of some at least of the practical difficulties involved.

I have tried to show that, at least where the funds are provided from public sources, there is a very definite financial limitation to the method of disposal.

This will become clearer on considering a concrete case. The Cawnpore Agricultural College has a four-year diploma course limited to twenty-five students per year, or a total of 190 students in residence. The college budget is Rs. 43,600, but this is clearly an under-charge, as it excludes all charges on the botanical and chemical sides, which are budgetted jointly with research, and it is merely the recurring charge without allowance for interest on capital charges or depreciation on building accounts. It is probable a figure of three-fourths-of-a-lakh is not an over-estimate—that is, a cost of Rs. 750 per annum per student. The question is, under what circumstances is the expenditure of this sum of public money justified? It is always difficult to argue with any degree of conviction as to the justification of expenditure where the return is as in this case, indirect. The subject is, therefore, best approached from a different aspect, and there are two such. The first is to discover the circumstances under which that return will be a maximum; and the second to consider the class of applicant now seeking admission.

The justification of the Agricultural Department must be found, in like manner, in the improvement of the economic conditions of the country, and, no doubt, the expenditure of the college is justified to some extent by the necessity of training members for that Department. That, however, is a minor matter, two only, out of the thirty-five students annually admitted, being admitted to the Service. Were that the only object of the college, it would appear possible to find a more economical method of recruitment. The truth is that the ultimate justification must be found in the future career of the 23 remaining students.

Now, considered in a relative aspect, it cannot be doubted that a single zemindar, possessor of several villages, who takes a personal interest in his estate and who is progressive, by reason of a liberal education such as the college is now in a position to give, is potentially a far greater asset to the country than the small zemindar or tenant cultivating a few *bighas*. In the former case the gain is not limited to the actual money value of the better crops produced, and of the extra gain due to better business methods, great though this may be. His property forms a practical demonstration which must have some influence on the surrounding countryside, and he himself becomes an unpaid propagandist of new methods. The latter, on the contrary, can do little more than grow better and more valuable crops, and he possesses little of that which we may briefly sum up as influence. The college will be filling its function to the full, therefore, only when

the main source of recruitment is the zemindar class, a class relatively small, perhaps, but numerically large and potentially powerful. It can hardly be doubted that a college with students so recruited would be in a position to do more to improve agriculture and the economic conditions of the countryside, on which that improvement so largely depends, than one with students recruited from any other source. It is the condition in which the college will most fully justify its existence.

That, at least, is the aim I have set before myself, since I have been in charge of the College at Cawnpore. It is, for many reasons, an aim not immediately reliable. The larger landholders are mostly non-resident and have more immediate interest. The smaller ones are shy and frequently insufficiently educated. For the present it is sufficient if a few only of this class come, and it is a hopeful sign that this is the case.

The majority of applicants at the present time are, nevertheless, men merely seeking Government appointments intermixed with true agriculturists, petty zemindars or tenants. Frequently the application is accompanied by an appeal for a stipend. With the former I have no concern, they are not the type of student for whom there is any opening. The latter, however, form the class to which the Department looks for its recruits and the admission of a few is justified on this ground. The claim for a stipend is a different matter, and as it is here that the financial aspect receives its clearest demonstration, a short digression will not be amiss.

To any one who has had to deal with the selection of students for admission to a college, the frequency with which poverty, as a ground for admission accompanied by financial assistance, is advanced, will be well-known. The fallacy of such a claim has, as far I am aware, never been shown up; it is certainly not generally recognised. What applies for one, applies for all. Were poverty to constitute in one case a claim to admission to a college with a stipend, every youth of suitable age would be justified in demanding this concession, and the collegiate education would become the standard, the State is called upon to provide. The cost, placed at Rs. 750 per annum in the case of the college, to the State is clearly prohibitive, and those persons who advance such a claim forget that the money to provide the education and stipends ultimately comes from their own pockets. The fact is that stipends are only justified in cases where poverty appears as a check to an ability, to the possessor of which a college course will open a useful and profitable career.

I have now attempted to define, by reference to the Cawnpore College, the legitimate function of

such an institution. That function is, to a certain extent, based on local conditions, and is not therefore, necessarily identical with that of other colleges. The same financial consideration, however, underlies all, and the college aspect can never do more than touch on the fringe of the problem, reaching as it does only the numerically smallest class of persons connected with the land. If the true function is performed, however, the college will be the means of providing, in the departmental district officers and in the progressive zemindars, two agencies of effective agricultural development. The speed of introduction of improved methods is, however, a reciprocal process dependent not only on the skill and energy of the instructor, but on the receptivity of the instructed. While, therefore, the one is providing for the former, the latter college is in no way provided for. The form of education provided is too expensive for the mass, it is moreover collegiate. (a) What is here required is a cheap form of secondary education, complete in itself and complete within the limits provided by the age at which the average boy leaves school. In the United Provinces, the sole attempt hitherto to provide an education of this type is in the vernacular two-year course of the college. The institution of this course and its location at the college is admittedly a temporary arrangement and the course suffers from many disadvantages. In the first place, the age of admission is too high for a true secondary school, being the same as for the four-year diploma, or collegiate course. Secondly, in addition to supplying a course of instruction suited for the class which we are now considering, it attempts to meet the needs of the members of that class which I have shown the college should attract, but those members who possess insufficient knowledge of English to take that course, two aims which are incompatible. While, therefore, the course has not been without its uses, it fails in several directions to meet the needs of the situations. In other Provinces greatest progress in attempts to solve the problem has, perhaps, been made in the Bombay Presidency where several vernacular agricultural schools are in existence. The cost of each pupil is stated to be Rs. 180 per annum, grounds which alone would place it beyond consideration for universal adoption. (b) The main problem, the provision of schools supplying an education fitted to the needs

(a) Or should be. Owing to the weakness of the secondary education, the teaching has to make up the deficiency and is largely secondary in character.

(b) A boarding secondary school of the present type costs approximately Rs. 60 per annum for each pupil.

of the mass of the agricultural population and at a cost which makes possible their establishment in numbers sufficient for the accommodation of the available pupils, still awaits solution.

The primary object of such schools will be to raise the receptivity of the younger generation of agriculturists and the method of attainment must be through education under conditions which retain the association with the land. This is a very different proposition to the provision of vocational schools of which the main function is to impart technical skill. In the latter, technical instruction is the primary consideration, and theory is only taught in so far as it bears on the particular trade. In the former it is true, subjects being on the vacation may, and do, form part of the course, but the centre of gravity of the instruction is shifted. These subjects are taught for their internal value as a means of education, and the practical application is left to be drawn by a process of natural imbibition in the daily life. It is here, as I think, that the efforts, which have been made to introduce agriculture into the existing schools, have failed.

Let us consider for a moment how an agricultural school of this type would be organized. The courses of instruction are to be educational and the students are to be introduced to an appreciation of a standard of country life, something superior to the ordinary village life that, I have known, by a process of familiarity. Although, therefore, not directly a part of the education, the conditions and their arrangement will form as, if not a more important section of the school organization than the purely educational section, in that they will form an essential of all such institutions, while modification to suit the different grades will be made in the educational courses.

I will try and bring out the main features of such an organization by a description of such a school as I conceive it. It is to offer a practical demonstration of village life under improved conditions, under which the student will live and have his being with a degree of intimacy that will render those conditions a normal part of his existence. Now the essence of village life is the family, living as a unit cultivating a certain area—greater or less according, in part, to the circumstances of the family, but, in part, also, according to the locality. Thus the holdings in the East are, on the average, much smaller than those in the West of the Provinces, and allowance will have to be made for such divergencies. The school will now represent a village, the unit of communal life, composed of families, the unit of private life. Assuming a middle school with a five-year course and the maximum age 17 or 18, the students of the

senior class will each represent the heads of the families which will be made up of, roughly, one student from each year, giving in all five members to each family. The school will have approximately sufficient land to provide for each "family" of five students an area, roughly, equal to the average holding of the locality. In this community the headmaster and his assistants will play the role of the zemindar and his agents. He will apportion the farm lands among the "families," issuing yearly leases at reasonable rents, and the "family" will then cultivate the land under his directions, actually performing the operations themselves. The next year a re-arrangement of students in the "family" necessitated by the head leaving and by the introduction of new admissions, combined with a re-distribution of leases, will give ample opportunity for arranging that each student will obtain practical experience, during his period of residence of each of the crops cultivated.

Before passing to the strictly educational aspect of the course, we may consider this proposal in some further detail. I have said the headmaster will play the role of zemindar; he will, if the scheme is to attain its full development, have to play many parts. As zemindar, I have stated, he will issue leases at reasonable rents. It is not proposed that those rents should necessarily be paid. The headmaster should also organize the school as a co-operative society, of which the individual heads of families are members and from which the rent can be advanced. Reality can be given by the payment of a nominal sum by each "head" for membership, but the rent and most other transactions, being dues to the headmaster, may be book entries merely. Produce would be similarly pooled for disposal on co-operative principles and may even be used to supply a co-operative store to supply the necessities of life of the students. If payment be actually made by each student or by each "heads," a nominal bonus may be given, otherwise the transactions will, throughout, be nominal as regards cash values, but in all respects should conform with reality. Thus, the amount shown to the credit of a "family" for produce received should be based on the actual sum for which the produce was disposed.

The above constitutes what I may term the environmental aspect of the school; the educational aspects may now be considered. This is an aspect which, more than any other, suffers from the danger of dogma, and, in the present case, it in no way differs from the general problem as it appears in all educational institutions. It is a problem to which each individual will offer a

different solution depending on his particular personal bent. Such solution as I shall offer is, therefore, of necessity so coloured. Education as found in this country fails in two directions—the first, practically; the second, accuracy. With the former I have already dealt; the whole organisation of the environment is aimed at developing this character. The latter must be developed in the class-room. For this purpose the following subjects seem best fitted: mathematics, associated with which may be book-keeping and accounts, and elementary physics. With these subjects emphasized, the remainder of the course will be composed of those subjects which form the basis of the curriculum of the ordinary school, preference being given to subjects which have some association with the life the students lead. Care, however, must be taken to teach each as a balanced subject without undue prominence given to their supposed practical aspects. Among such subjects, I should place English, geography, physiology and elementary studies of plant life. In the above course—and it is not desirable to go into greater detail at present—my main object being to develop principles rather than detailed schemes, the only direct point of contact between the environmental and educational sides of the school lies in the accounts, for which the books of the institution may well be used to provide practical examples. A comparison of this outline with, for instance, the curriculum of the Loni School, will bring into prominence the difference I have tried to emphasize.

A pupil taking five years to pass through such a course would thus gradually imbibe the practical aspect of agriculture; would be gradually introduced to those conditions which tend to place the cultivator in a position of sturdy independence and self-reliance and should by the end of his school career, be fitted to return to his home and the reality of life with a sense educated to realise the more backward conditions and a will to remedy them—a condition of mind and body suggestive of a career as a useful citizen. The information will, moreover, be learnt by a process of absorption from constant association, one of the essential conditions if the soundness of my contention is admitted.

There remains the question of cost, the question whether the scheme will satisfy the second or financial consideration, which it must do if it is to justify the expenditure of public funds involved. With thirty students in each class, a school of 150 will be formed for which an area of 150 acres' cultivation will be required if each holding is calculated at 5 acres. As most of the labour will be provided by the students, the labour bill will be small and the profit on cost of production should be

considerable. In addition, there will be the capital charges and the cost of instructional staff. The former will be larger, but the latter not necessarily greater than the same charges of a school of the same standing but of the usual type. The unknown factors at the present stage are two numerous to make it possible to draw up a balance sheet which would approach any degree of probability to the actual, but it seems more than probable that the cost would be, on the balance, low. One point at any rate is clear; unless the form is working at a profit, and a handsome profit, it will not be fulfilling its function, and we have here, therefore, a very simple and practical test.

One point remains to be considered, and it arises from what I have said early in this article, in bringing out the difference between the coach and the teacher. However good the system is, it will never succeed in producing the desired result unless the agent, in this case the teacher, is competent to develop its potentialities. The aspect requires no enlargement, as its essential nature appears to be fully recognised and formed the subject of much discussion at the Simla Conference. For the present purpose it is sufficient to point out that the supply must be derived from the Agricultural College and forms a third legitimate field, additional to the two already described, of activity for the college.

The proposals outlined above constitute a scheme for providing for the educational needs of the largest section of the community, and, as far as considered, suffices for the main educational function, to fit the average youth for a useful and contented life in the conditions under which he was born. There remains the second aspect, without which no educational system can be considered complete, that of providing a ladder by which those intellectually qualified can arise. If such a ladder is to be provided it follows that a system of secondary schools leading to the University or to the Agricultural College must be introduced. On this subject, the Simla Conference showed considerable diversity of opinion, and the probability is that the exact direction in which this will develop cannot be forecasted with any degree of certainty, and will depend on the exact form of school that is found to succeed. I will content myself with noting a single point. The type of school I have outlined contemplates the performance of the field-work by the pupils each holding and possessing a body of pupil labourers of decreasing age. If such a scheme is to succeed, and the practical work is to be carried out with that efficiency which will alone ensure success, the oldest pupils must have attained a physical development enabling them to do the more arduous field labour.

That consideration would seem to indicate that greatest efficiency will be developed in those schools where the age-limit is relatively high, and hence that the type is best adapted to schools of the secondary class. The absence of the necessary physical power in the students of the Loni School was one of the points that struck me most forcibly in the one visit I was privileged to make to that school. It would appear possible that schools of this type would lead directly to the college, and that the ladder we desire would be provided in this manner. The truth is that the practical difficulties, not the least of which is the absence of teachers, are such that the development of such schools must be slow and will afford ample opportunity for gaining practical experience. It is not desirable, therefore, at the present time to enter in too great detail into such matters. It is essentially a case for trial and experiment, the establishment of a few schools of the type described and their gradual extension in that direction which experience shows to be most desirable. What is essential is a clear comprehension of the fundamental principles which underlie the problem—a comprehension so sharp that it can be used as a test during each stage in the experiment. To the best of my ability I have attempted to supply the material for such a test.

GOVERNMENT TRACTOR CULTIVATION IN ENGLAND AND WALES.

Capt. G. T. Hutchinson, Mechanical Cultivations Commissioner, Food Production Department, writing in the *Board of Agriculture Journal* for December, 1918, says:—

In order to appreciate properly the part played in British agriculture to-day by the tractor, and its possibilities in the future, it is essential to consider briefly the history of the tractors operated by the Food Production Department—the so-called Government Tractor Scheme. Without this information, misleading conclusions might be formed, and full value could not be obtained from the lessons taught by the Government Tractor.

INAUGURATION OF THE SCHEME.

The scheme was instituted at a moment when, in consequence of submarine warfare, it became necessary to grow as much corn as possible, and to grow it against time, in the British Isles. To carry this policy into effect throughout the country, some increased and more rapid means of cultivation than those hitherto in practice were demanded. Even if

sufficient horses had been available their work was too slow for the emergency; further, every team of horses required a man, and sufficient men could not be found. Nor could increased steam tackle meet the difficulty, for additional sets could not be procured quickly, and corn could be grown in many parts of the country where the geographical conditions made the use of steam tackle impossible. The Government, therefore, resorted to the tractor, which could operate in Districts where steam tackle could not, and which required less labour and covered more ground than horses.

THE SCHEME ITSELF.

In these circumstances, little use could be made of the experience gained with the few privately-owned tractors in the country. It was considered necessary to purchase tractors of all types, wherever they could be found, to set them to work at once, and to deal with the question of suitable types and the renewal of worn parts as soon as the situation should permit. A beginning was made late in the spring of 1917, and the scheme was rapidly developed. In order to utilise the tractors to the fullest extent possible, some system of centralised control had to be improvised, and at the same time local arrangements had to be made for working them, and keeping them in repair. These facilities were supplied by the mechanics and repairing shops of the motor trade, which was, in effect, entrusted with the local management, under the control of the Food Production Department. Tractors were received by each county as they became available; the Tractor Representative for the county, acting in concert with the Agricultural Executive Committee, arranged their work; they were manned mainly by soldiers from the Agricultural Companies; and they were kept running by the proprietors of the provincial motor garages.

Their task was to plough land at all costs, and the initial difficulty was to overcome the reluctance of the farmer to employ an untried and suspected means of cultivation. They could not wait for suitable weather or suitable land; the position was like that of a new business, where orders must be canvassed for, unremunerative contracts accepted, and a supply created, in the hope that it will create a demand. Such was the preparation by the Government tractors for the 1918 harvest. After the completion of the spring cultivation, it became possible to place the scheme upon a more workable basis. At one time, more than twenty types of tractors were employed by the Government, and the inconvenience and frequent impossibility of providing spare parts and repairs for each type constituted a serious handicap. Within the past few months it has been possible to

reduce the types to six, and to ensure the supply of spare parts, so far as war conditions permit. It has also been possible to decentralise the scheme, and to hand over to each County Committee the control of the tractors allotted to it. In several counties a further advance has been made by loaning the tractors to individual firms to operate as a private enterprise, subject to such control as the County Committees consider necessary. Experience has shown that with tractor ploughing, as with other forms of business, better results are obtained by private enterprise than by Government employees. It has also been possible to release tractors for sale to individual farmers, and since the beginning of this year some 3,000 to 4,000 tractors have been disposed of in this way.

RESULTS OF THE SCHEME.

To summarise briefly the results of the scheme, it may be said that it has fulfilled its object. It enabled County Committees in every instance to carry out their programmes for increased corn production; it assisted them to reap their harvest; and it has introduced a new and highly efficacious means of cultivation to the farmers.

To form a proper estimate of the capabilities of this instrument, however, a careful distinction must be drawn between the tractor of the Government scheme and the tractor in the hands of the farmer. The farmer was employed as an emergency measure; in consequence its work was often imperfect, labour was wasted in connection with it, and operating expenses were high. In the hands of the farmer, on the other hand, the tractor economises labour and does the work cheaply. It would be most unfortunate if agriculturists should be tempted to base their opinion of the merits of the tractor solely on their experience of the tractor scheme.

DIFFERENCE BETWEEN THE GOVERNMENT AND PRIVATE TRACTORS.

The points of difference may be conveniently grouped under five headings:—

(1) *Working Expenses.*—The first of these points concerns working expenses. The exigencies of the situation required that the Government tractors should be available wherever they were required. They were, therefore, grouped in units of (in most cases) ten tractors, each unit serving a wide district. Steam tackle working under similar conditions would move from farm to farm as a self-sufficient unit, complete with plough, cultivator, and cabin for the crew; the farmer would have fuel and water ready in the field. The tractor, however, cannot haul its own fuel supply, and, under war conditions, the farmer cannot provide it. Petrol, paraffin, and grease must be delivered daily in a light motor-van:

this method is expensive, but delivery by horse transport would be too slow, and a motor-lorry could not reach the inaccessible fields in which so many of the tractors are employed.

In cases of mechanical trouble, a mechanic must be summoned from the head-quarters of the unit to effect the necessary repairs. From time to time a supervisor of some sort must also visit the tractor, to see that the men are working, and that the ploughing is satisfactory. With the privately owned tractor these officials disappear; the farmer keeps the fuel in his coach-house, supervises the work himself, and avoids the necessity of frequent repairs by taking care of his tractor. If bad weather stops the work, he can find another job for the driver, but the drivers for the 4,000 Government tractors, scattered in billets all over the various counties, often spend an idle day.

(2) *Repairs.*—The second point to be considered is the question of repairs. Most of the tractors operated by the Government were built in America, where paraffin as a fuel is little used. The engine is designed to burn petrol or petrol substitutes, which are drawn off from the crude oil because of their volatility. Paraffin is a by-product of these oils and is not actually a volatile fuel oil. It has to be made so by means of an atomiser and superheaters, before being introduced into the combustion chamber. Time and experience are now meeting the difficulty, but last spring the work of the Food Production Department would not be delayed. Petrol could not be spared, but paraffin was available. Tractors were hastily adapted and worked with paraffin, and in some cases this has resulted in excessive wear of engine parts and consequent engine trouble. Competent mechanics have not always been obtainable when required, and the supply of spare parts, in war time, in sufficient numbers for the Government tractors, has been a perpetual difficulty. The critic who concludes that the tractor is no good, because he has seen one standing idle for weeks in the field, should enquire whether it is in fact waiting for a spare part which lies at the bottom of the Atlantic! The peace-time tractor will not suffer from this handicap.

(3) *Nature of the Work.*—A third point to consider is the difference in the nature of the work which the Government tractor and the farmer's tractor are required to perform. For various causes, which it is unnecessary to discuss here, in nearly every part of England some very unsuitable grass land has been ploughed up within the past twelve months, and the most unsuitable has usually been allotted to the Government tractors. Much of this work has not been ploughing, but reclamation. The Government tractors carried out some astonishing

performances last spring. They dug themselves deep into the Midland clay, they broke implements innumerable on the concealed rocks and boulders of the west country, and they skidded vainly about the hillsides of Wales and the North. Fatal accidents were not unknown, but land was ploughed—at a cost—and crops were grown: it was "magnificent, but not agriculture." No doubt this reclamation work has already justified itself, and the average farmer will not purchase a tractor to reclaim land, but to plough.

Government tractors were also operated in typical grass counties in the Midlands and in the West, where each farmer had sacrificed one field to the good cause. Here the fields themselves might be suitable, but the amount of roadwork involved in going from farm to farm, with consequent high fuel consumption and wear-and-tear to the tractor, made economic working impossible. This difficulty will not apply to the farmer's tractor.

(4.) *Labour.*—A fourth point of difference is labour. At the end of the spring cultivation in 1917, the Food production Department was operating about 600 tractors; at the same period in 1918 it had over 4,000. Drivers had to be found and trained from such material as the exigencies of war left at the disposal of the Department. When the Government tractors are disposed of, these men will be available for the farmers, and already measures are being taken to assist the training of drivers for privately-owned tractors. The farmers will at least be able to select a suitable man to train for his tractor, but the Food Production Department was never in a position to pick and choose. A most encouraging feature is the excellent results so frequently achieved by the hastily-trained Government drivers, and the satisfaction which women drivers have given in so many counties.

(5.) *The Implements Used.*—Another advantage which the farmer's tractor will have over the Government tractors is that the farmer will be able to attach it to the plough or cultivator, which is most suitable for his particular requirements, whereas the Government tractor is limited to such implements as are now available. In nearly every part of the country the experience of generations has evolved a special plough, cultivator, or harrow, to deal with local peculiarities of soil or cultivation, many of which are manufactured locally. In war-time the out-put of such implements is limited, and if all are commandeered by the Government, the demands of private purchasers cannot be met. It has, therefore, been necessary to purchase implements in bulk for use with the Government tractors, largely in America, in order to carry out Government cultivation without unduly curtailing the supply available

for individual farmers. It is, however, unreasonably to expect that their work should be equally satisfactory in all localities. One type of Oliver plough made to turn a wide furrow has proved unsatisfactory on hard ground, until converted to turn a narrower furrow. In some counties a heavier cultivator than those cultivators now obtainable is demanded. In these cases it is manifestly unfair to condemn the tractor because the right cultivator's implement is not obtainable, and the work has suffered in consequence.

POSSIBILITIES OF TRACTOR CULTIVATION.

It remains to consider what profitable conclusions can be drawn from the experience of the Government Tractor Scheme as to the possibilities of tractor-cultivation in England.

In the first place it is established that to obtain the best economic results from the tractor, it should be in the hands of the farmer, and should not leave his farm, except, perhaps to assist his immediate neighbours, in cases where such an arrangement is possible. Though there is no doubt that tractor-ploughing firms will be started, to carry out work on the same lines as the existing steam-ploughing firms, the difficulties of fuel supply, roadwork, and supervision, must always place this system at a disadvantage, when compared with the privately-owned tractor.

Work Done.—Sufficient has already been said to indicate that the acreage results achieved by the Government tractor must not be accepted by prospective purchasers as a final test of their capabilities. The statement of weekly averages in the counties, circulated by the Department, shows that few counties are able to maintain an average of ten acres ploughing per week per tractor in commission, or a fuel consumption below five gallons per acre. In nearly every county, however, a Fordson tractor, with a self-lift plough, has ploughed five acres in the day under favourable conditions, in the hands of one reasonably competent man or woman. The same tractors have frequently cut upwards of fifteen acres in the day with a binder, which would not be exceeded by two teams of three horses working in two shifts. The fuel consumption of the farmer's tractor should be in the region of three gallons per acre ploughed.

Quality of Work.—It has also been proved in every county that the quality of the work done by tractors can be perfectly satisfactory. It serves no useful purpose to compare their work with that of horses or steam tackle; because all three will be required; it must depend on circumstances in each case which method can be, or should be, adopted. Plenty of bad work has been done by the tractors, the reasons for which have been fully explained. The best testimony in their favour is the verdict of

the farmer, and whereas a year ago it was necessary to canvass for orders for work for the limited number of tractors available, to-day, in practically every county, the tractors are scarcely able to carry out the daily increasing number of contracts for ploughing.

Quick Work.—It is now realised that the tractor enables the farmer to cultivate at the right time, and the importance of this is appreciated by every practical farmer. Theoretically, if a man has the requisite "strength" for his farm, he should be able to keep it employed throughout the greater part of the year, and to carry out the successive operations of husbandry, each in its proper course. In practice climatic conditions make this impossible. One operation is delayed by the weather and subsequent operations suffer.

The broad distinction between the bad and the good farmer is that the farmer is usually in arrears and the latter beforehand with his work, because he has a reserve of "strength" to meet these emergencies. The tractor provides a reserve of cultivating strength which eats nothing and costs nothing when it is not employed. For example, during the past summer many farmers were able to employ all their horses for leading their earliest corn crops, while the later ones were being cut with tractor and binder, and by this means to complete their harvest before the weather broke. The same men could then plough their stubble with the tractor while their horses were still leading the later corn crops. Their neighbours, without this additional "strength," have had corn spoilt and have afterwards had to spend idle weeks waiting to plough their sodden stubbles. There is always a certain period of the year when the soil is in the improper state for ploughing; it is then possible to plough better and deeper, leaving the ground in good condition for subsequent cultivation, and for preparation of the seed bed which will give the best yield. If this opportunity is lost because the normal strength of the farm is otherwise employed, it cannot easily be recovered—on heavier soils it may mean a year's delay—but with the tractor it need not be lost. It is a notable fact that in some counties, in spite of the wet autumn, work on the farms is actually more advanced to day than it was at this time last year—thanks to the tractor.

TYPES OF TRACTORS.

It is often asked, which is the best sort of tractor to buy? The Food Production Department have employed more than twenty different types, all of which have had their good and bad points. Six types have now been retained, but it must be remembered that, in eliminating, the possibility of ensuring an adequate supply of spare parts for the types retained was an important consideration. Of these, the

"Titan" has done excellent work under the most variable conditions. It has ploughed on the Devonshire hill-sides and in the holding clays of the Midlands, and it has been used as a stationary engine to thresh, to cut chaff, or work a saw. The main improvements which have been made in some cases are a better fore-carriage, and special spuds on the wheels to hold on slippery ground.

Another "general utility" tractor is the "Overtime," and many of these tractors have now been in the hands of private owners for upwards of a year, and have given satisfaction.

The "Clayton Shuttleworth" is a powerful and more expensive tractor, which has been found especially suitable on heavy clay land, as the pressure on the land is considerably reduced by a "caterpillar" track. It is the only tractor of this type now operated by the Department.

The "Saunderson" is another British-made tractor, which has the advantage of a winding drum, and has therefore been in request for threshing as the drum enables it to haul a threshing box up a steep pitch in a country lane. It has been found more satisfactory than other tractors for road-work.

The "25 H. P. Mogul" is a heavy tractor, employed mainly for threshing but in some counties it has done a lot of work with the plough, while the land was in suitable condition. It is too heavy for use in wet land.

The "Fordson" tractor is probably the cheapest tractor on the market, and, if its limitations are recognised, it is the best labour-saving device which the farmer can obtain. It is the only Government tractor equipped with a self lift plough, and can, therefore, be worked by one man. It is not yet a "general utility" tractor, as it may prove to be too light to be used effectively as a stationary engine, but for the purpose of cultivating it is an acknowledged success. It is often said that it is unsuitable for heavy land, but its success in Essex and other heavy-land counties has led its adherents to believe that, when heavy land is in the proper condition for ploughing, the Fordson can plough it, and when it is not, it is the best to leave it alone. No less than 2,500 of these tractors have already been purchased by private owners, a fact which indicates the farmer's opinion of its merits. For some time its reputation suffered because the No. 7 Oliver plough turned a 14-in. furrow, which in many cases proved unsatisfactory. This plough has now been converted to turn a 10-in. furrow, with the best results, and two other types of Oliver plough, one of them specially adapted for ley-ploughing, will shortly be on their trial in the counties. Other improvements now being carried out by the Department are the

provision of a "governor" for the engine, a break for roadwork, and a "release" attached to the draw-bar, to prevent accidents in case of the tractor rearing up. In some cases, too, it has been found necessary to alter the strakes in the wheels in order to gain a better hold on slippery ground.

HOW TO SELECT A TRACTOR.

Unquestionably the proper course for a prospective purchaser to adopt is to examine the work of his neighbour's tractor, or of the different types of Government tractors in his county, before making his selection. He should have no difficulty in obtaining full information from the officials employed by the Executive Committees of his county, and by this means he can see and judge for himself which type is best suited to his particular requirements. He should also remember that the implement is just as important as the tractor, and can form his own opinion of the former by examining the various makes now utilised by the Executive Committees. For example, the work of the disc cultivator, and of other new implements, may be inspected with advantage. It may be added that, though tractors will undoubtedly be improved, it is better policy under present circumstances to purchase one of the reliable tractors now available than to wait for a perfect type. It is vain to hope for a tractor which will be equally good for cultivation and road haulage. Presumably the motor-lorry represents the best type of internal combustion engine for roadwork, and it is impossible to imagine any form of motor-lorry which could be utilised with a plough.

If British agriculture is to derive full advantage from the experience of the Food Production Department, much can be done by the Executive Committees of the counties. These Committees have recognised that the Government tractors must work primarily for those farmers who could not cultivate under present circumstances without assistance and that applications for tractor-ploughing received from farmers, who should be in a position to cultivate for themselves, must be deferred. The latter should purchase their own tractors or more horses. It is to be hoped that the time is not far distant when all farmers will be in a position to dispense with Government cultivation. Meanwhile, Committees can place at the disposal of the farmers the experience gained with the different types of tractors and implements employed in their county.

The writer of these notes has prepared them after seeing something of the work of the Government tractors in practically every county in England and Wales, and after discussing the difficulties encountered and the results achieved, with those who have operated the tractors since the inception of the scheme. Any points which may be described as technical have been carefully verified by the experts employed by the Food Production Department. Though criticism of the tractor scheme is by no means unknown, there are no two opinions as to the value of the work of the tractors, and it only rests with the farmer to take advantage of what is probably the widest form of practical demonstration ever carried out by an Agricultural Department.

SPEECHES AND PRONOUNCEMENTS.

THE UNIVERSITY IN NATIONAL LIFE.

Mr. Fisher's vision of the Future.

The Master of Balliol (Mr. A. L. Smith) presided over a large gathering in the Sheldonian Theatre, Oxford, recently, when Mr. H. A. L. Fisher, President of the Board of Education, delivered an address on "The Place of the University in National Life." The meeting was convened in connexion with the Barnett House Conferences. Among those present were Mr. J. A. R. Marriott, M. P., the President of Magdalen, the Warden of New College, the Master of University, and the Warden of Keble.

The Chairman said he felt certain that Mr. Fisher, more than anyone, held the key of the present situation. They could not expect a permanent satisfactory settlement of the international situation, or of the home situation, the industrial and economic situation, without a better-educated people.

Mr. Fisher, in the course of his address, said that our system of public education had been transformed by the Acts of 1902 and 1918, and the State had now begun to exercise a powerful influence in the direction of scientific research. At the same time, there had been a great increase in the valuable extra moral work conducted by the universities, which had now taken upon themselves the burden of providing education of a university character for men and women who had missed their opportunities in early life. The war had brought into clearer relief the fact that the universities and technical colleges had stood for a great deal in the national equipment during these times of stress and strain, and the largest drafts had been made upon their resources, energy, and good will. No fewer than 30 university laboratories were made use of in 1918 in a single department of warfare. The fact that the State had become conscious of the value of the university as an integral constituent of national power acquired more and more significance. He

welcomed the tendency towards co-operation between universities as to policy. They could not be content to leave events to the blind play of competition, and he should be very sorry if the deciding factor should rest with the Government.

It would be more wholesome and more in accordance with the academic life if the policy of the university development for the whole country were to be shaped in the interests of the whole country and upon the future of national needs by the universities themselves. But if it were to be really fruitful it must not be confined to the rare occasions upon which joint action might be compelled by some international exigency or great departure in academic policy; it should be a continuous principle of academic management.

EFFECT OF NEW LEGISLATION.

The new legislation would affect the universities in three ways. Presumably it would fit a great number of men and women for university life, and so increase the number of candidates for the bachelor's degree. It would certainly create a greatly increased demand for teachers in State-aided schools all of whom would, it was to be hoped, at some time or other, come within the influence of the universities. Lastly, it would create a new "clientele" for extra mural university teaching. From every quarter reports had come in that the boys and girls who had left school for munition work had on their return to educational work greatly deteriorated, had become very difficult to manage and very much coarsened by their factory work. All that would be greatly changed by the development of cheap secondary schools, and by the introduction under the Act of 3 of a system of part-time day continuation classes. Some part-time classes had already been established in advance of the obligations created under the Act, and so far as he had been able to observe they had been a brilliant success, and he believed that 30 years hence that reform would be found to have been profound and all pervasive, for it would have stamped the university on the consciousness of the people as a democratic institution open to all, and spreading its influence over the whole surface of national life. There was another territory which might be occupied by men trained in the liberal discipline of the universities, with ample profit both to themselves and to the community—the county and municipal services.

COTTON COMMITTEE'S RECOMMENDATIONS.

The Salient Points.

The report of the Indian Cotton Committee which has just been published is signed unanimously. The committee says: "We have divided our report into two parts, the first of which deals with the agricultural and irrigational aspects of cotton cultivation and the second with the commercial aspect, but in conclusion we wish to emphasize as strongly as possible that the recommendations in both parts must be treated as an organic whole. It is of little avail if the Agricultural Department evolves pure or improved strains of cotton, increases the outturn by the introduction of improvements in agricultural practices, and ensures cleaner methods of picking, or if the Irrigation Department provides facilities for the extension of the cultivation of cotton, unless the cotton produced is marketed in a condition which enables it to secure its proper price and unless the cotton trade pays that price for it. We have pointed out that the cotton trade is not in a position to cope with the numerous abuses which have been so detrimental to the reputation of Indian cotton in the past, without assistance from the Government, and that a policy of *laissez faire* in such matters is no longer possible or desirable. The recommendations we have made in the second part of our report are, therefore, in every way as important as those in the first part if real improvement in Indian cotton is to be obtained. If the proposals we have made in both parts are accepted, the future of Indian cotton will be in the hand of the trade.

THE FUNDAMENTAL ASSUMPTION

on which we have acted throughout is that there is a genuine demand for long staple Indian cotton and that the trade is willing to pay a sufficient premium for it to make it worth the while of the cultivator to grow it but that there have been various obstacles in the past which have prevented it from doing so. We have submitted proposals which will remove those obstacles and will enable long staple cotton to compete with short staple cotton on its merits. It will, therefore, rest with the cotton trade to convince the cultivators in the only way in which he can be convinced that long staple cotton pays him better than any other varieties. If it succeeds in doing so, as we trust it will, India will be able to make no mean contribution to the resources of the Empire."

The report issued is a bulky volume of 200 pages and contains several maps. Each province has a separate chapter devoted to its conditions and at the end of each chapter are the committee's recommendations and conclusions. Touching the function of a

CENTRAL COTTON COMMITTEE,

the report states that in order to secure the co-ordination and co-operation in all matters relating to cotton, a central cotton committee of a permanent character, composed of representatives of the agricultural and co-operative departments, the director-general of commercial intelligence, the director of statistics and representatives of the trade should be established with its head-quarters at Bombay. The agricultural adviser to the Government of India should be the president of the committee, the staff of which should include a whole-time secretary, and a technologist. The main functions of the committee would be to act as an advisory body to Government and the trade on all matters connected with cotton, including questions relating to legislation and the licensing of ginning and pressing factories, to act as a centre for the dissemination of information regarding cotton and to assist the agricultural department through its technologists in obtaining authoritative valuations of new varieties. In order to carry out its functions the committee would act through and with provincial committees and local sub-committees. Such committees would be formed in all the provinces in which cotton is grown, except Bihar and Orissa and Assam. In view of the special circumstances of Burma, the provincial committee in that province would be the advisory body in regard to the licensing of ginning and pressing factories.

The Post of an Imperial Cotton Specialist will cease to be necessary on the formation of the central cotton committee and should be abolished on the retirement of its present holder. Samples of cotton submitted by the Agricultural Department for trade valuation, should, in the first instance, be not less than twenty pounds of lint. If the report on ores is satisfactory 200 pounds of the cotton thrown on a field scale and handled under ordinary conditions should be sent for a mill test. Dealing with

THE WORLD'S POSITION

in regard to cotton, the report says: The total world's production in pre-war conditions is estimated by Professor Todd at about 25½ million bales of which the United States produced 15 million bales.

The American crop, forming as it does very nearly three-fifths of the total outturn of cotton, is, therefore, the predominating factor in the world's markets. During the first three years after the war broke out, it averaged only 13½ million bales whilst the crop of 1917-18 was estimated at only 12 million bales and that for 1918-19 is estimated at 12½ million bales.

Table 4 in appendix 2 shows the very striking increase in the proportion of the crop consumed by American mills.

Whereas in the quinquennium, 1890-95, it averaged only to 2,758,000 bales out of a crop of

8,346,000 bales or 33·05 per cent, in the quinquennium 1910-15 it averaged 5,769,000 bales out of a crop of 14,558,000 bales or 39·63 per cent. For the three years 1915-18, it averaged 7,600,000 bales out of a crop of 12,871,000 bales or 59·14 per cent. It is evident, therefore, that unless fresh sources of supply are rapidly developed, the high prices of cotton, at present prevalent, are not likely to fall to any appreciable extent even with the return to more normal conditions, especially as all the countries of the world will be seriously short of cotton after the war.

In these circumstances it is obvious that

THE LANCASHIRE COTTON INDUSTRY

the importance of which to the Empire needs no comment from us, is faced with a serious situation and that it is most desirable that it should cease to be almost entirely dependent on a source of supply, the feature of which is so problematical. It is equally desirable, in the interests of the Empire as a whole, that an alternative source of supply should be found within the empire. India, as the largest cotton producing country in the Empire, and the second largest in the world, clearly offers the greatest possibilities of any considerable increase in the supply of cotton in the near future. Apart altogether from the possibilities of an extension of the area under cotton as the result of high prices or of the provision of irrigation facilities and of obtaining an increase in the outturn by the introduction of superior varieties, the average yield per acre of the Indian crops is only about 85 pounds of lint, whilst that of the United States crop is nearly 200 pounds per acre and the Egyptian crop 450 pounds. The condition of affairs is moreover even worse than is represented by these figures owing to the conditions in which Indian cotton is marketed. It has been estimated that Indian cotton loses about ten per cent in the blow room more than the American or Egyptian cotton, thus reducing the real average yield per acre to about 70 pounds. The scope for obtaining an increased outturn merely by an improvement in the agricultural practice is, therefore, considerable. Of the average annual Indian crops of between four and five million bales, very little is at present used by Lancashire as is shown by the fact that the average exports to the United Kingdom for the five years ending 1917-18 were 2,15,000 bales only, of which a large amount in regard to which we have not been able to obtain exact figures, was re-exported. As far as Lancashire is concerned, the immediate necessity is an extension of the cultivation of long staple cotton in India. The problem is no new one. It has occurred to the attention of the Government of India since 1788 but whereas the efforts to extend the cultivation of cotton, more especially of exotica

varieties during the early part of the last century, had, for their object, to render Lancashire independent of the American supply, the position now is that India herself has a flourishing cotton industry, which is interested equally with Lancashire in the question of obtaining larger supplies of better cotton. The tendency, already visible before the war in this country in the direction of spinning higher counts up to 305 twist has, we understand, become much more marked during the last two years, and there is every reason to believe that the advance in this respect will be maintained when the war is over. All the evidence submitted to us by the representatives of the manufacturing interests in India emphasized the importance which the Indian cotton industry attaches to the development of long staple cotton in this country.'

The committee next discusses the possibility of INDIAN COTTON REPLACING AMERICAN for Lancashire purposes, and says: 'It is perhaps desirable that we should, at the outset, state our views as to the possibility of growing in India, cotton of sufficient long staple to meet the requirements of Lancashire, and to replace American cotton in the Lancashire mills. It is a matter of common knowledge that the cotton trade practically originated in England and that at one time the export trade in manufactured goods was almost entirely in the hands of Lancashire. Owing to the development of cotton manufacture in other countries the Lancashire spinners have been compelled to confine themselves in an increasing degree to finer counts for which longer and finer qualities of cotton are required. The results of our enquiries as to the cottons grown in India which are suitable for purposes of Lancashire are shown in the table appended to this chapter. We are of opinion that the only parts of India from which assistance of real value to Lancashire can be expected in the near future, except in the important matter of hosiery yarns, to which reference is made in the next paragraph, are the tracts in which cotton of an inch or slightly more in staple can be grown in larger quantities. It will be seen from the table appended to this chapter, and from the subsequent chapters of our report, that the only tracts which answer to this description at present are those parts of Madras in which Cambodia and Karunganne cotton are grown and the Punjab where American cotton is making rapid headway. If the new varieties at present under trial in the latter province can be successfully established it will fulfil the necessary conditions to a greater extent than it does now. Egyptian, and American cottons have been successfully grown in Sind in spite of difficulties and we consider that cotton of both

these types of a quality better than any grown in the Punjab and U. P. to $1\frac{1}{4}$ inch in staple could be grown in that province with ease provided that perennial irrigation were insured by the construction of the Sukkur barrage, a point with which we have dealt in detail in chapter VII.

OUR CONCLUSION

is therefore that India cannot, for at least ten years, grow cotton in any large commercial quantity of a staple longer than $\frac{1}{16}$ th inch. Up to this length we think Madras might furnish 500,000 bales and the Punjab 200,000, bales but these cottons will only be capable of spinning up to 34s. twist and 44s. twist in the Lancashire mills if the conditions in those mills continue as at present. We think, however, that there will be a demand from Lancashire for cotton, for spinning counts up to these degrees of fineness for a very long time to come. We would add that every extra bale of long staple cotton, as the term is understood in this country, will liberate a corresponding bale of other growths for Lancashire and that therefore the proposals we have made with a view to securing an increase in the Indian crop will tend equally to the advantage of Lancashire and Indian industries.

MAN AND HIS DIET.

The report of the Food (War) Committee of the Royal Society (which has just been issued by the latter) on the food requirements of man and their variations according to age, sex, size, and occupation, although it concludes with the confession that it "shows how very inadequate is our present knowledge of the science of nutrition, and demonstrates the necessity of renewed investigations of almost every point discussed in it," contains much information of interest.

Taking as the average man one between the ages of 25 and 50 years, weighing unclothed 10st. 5lb. $5\frac{1}{2}$ ft. 7.4 in. in height, and performing eight hours average work in a climate such as that of France or England an attempt has been made to estimate his expenditure of energy under varying conditions of employment and the amount of food which he will require to replace the energy expended in the course of the day.

Nearly the whole of the food taken by man, it is explained, is oxidized in the body, and in the process of oxidation energy is given out, most of which

appears in the form of heat which serves to keep the body warm, while the rest supplies the energy for muscular movement. If the total energy given off by a man in the course of a day is known it is sufficient to give him a food yielding the same number of utilizable calories in order to cover entirely the requirements of the body.

The basal metabolism of the average man, which is defined as the metabolism or total oxidation changes of a man under ordinary conditions of nourishment but with the body and digestive organs at rest, is shown to equal 397 calories per square metre of surface per hour, or 1,687 calories per 24 hours. By measuring the excess of energy expended during eight hours work over that expended during eight hours of sleep, an attempt has been made to estimate the additional calories required by men in different occupations. For sedentary work these are placed at less than 400, for light work 400 to 700, for moderate work 700 to 1,100, and for heavy work 1,100 to 2,000 calories. Certain estimates are given of the probable requirements of men engaged upon different classes of work, but in view of the scanty experimental data available, the committee issue a caution with regard to the use to be made of them.

INFLUENCE OF EXTERNAL TEMPERATURE.

The influence of external temperature on the food requirements of the body is touched upon, but the statistics, which show that there is an increase of 10 per cent in the total bread and meat eaten in the winter months as compared with the summer months, being based upon figures during the war are given rather as showing the kind of knowledge which may be available in the near future than as conclusive proof of the needs of man.

It is pointed out that the influence of external temperature is minimized, in that man reacts by warming his workrooms and dwelling houses, and by putting on more clothes so as to hinder the escape of heat but as a general rule classes of individuals exposed to cold and wet would need an increased allowance of food apart from the nature of their employment, and in allotting an average ration to any class of worker the question of exposure to the open air and to cold should be taken into account.

NEEDS OF WOMEN AND CHILDREN.

The basal requirements of a man depending on the extent of his body surface, a big man requires more food than a small man doing the same work, and an elastic reserve should be provided where men receive a fixed diet unless the ration is placed so high that it suffices for the largest-sized man and is more than sufficient for the average and small men. It is estimated that the average man requires

3,000 calories a day, and the average woman, whose work is estimated at about two-thirds that of the average man, requires about 2,500 calories.

The food requirements of children based on basal metabolism, rate of growth, and bodily movements, still require, it is stated, careful investigation before reliable figures can be given. The statistics available show, however, that the amount of energy expended per unit of body surface is much higher in the case of children than in adults. The basal metabolism of a child aged 6.5 years is given as 57.5 calories, aged 12.6 years as 48.7 calories, aged 13.7 years 47.3 calories, aged 16.5 years 43.9 calories, and aged 19.25 years 40.7 calories, that for an adult male being 39.7 calories. The Committee say:—

It will be necessary, before expressing a definite opinion on the actual requirements of growing children and adolescents, to obtain more data from schools where the pupils' consumption is kept separate from that of the staff, and where an accurate record is kept of the pupils' weights so as to ensure that under the diets in question growth was normal. It is a significant fact that in many of the schools it was lately found necessary or desirable, in consequence of the food restrictions, to abolish morning school before breakfast, or to diminish the amount of time spent on games. There seems little doubt, therefore, that the growing lad between 15 and 18 if giving full scope to his ordinary muscular activity requires an amount of food even greater than that assigned to the adult manual labourer, and that the girl up to the same age requires not less than working woman. Any difference between the requirements of the boy and the girl up to the age of 18 is determined rather by the difference in their muscular activity than by the metabolic habit of their tissues. If the daily life of the girl is compulsorily made as active as that of the normal boy, her requirements for food will be as great as those of the boy, apart from the difference in size and weight. The inferiority of the woman in the last two factors will only make itself felt from the age of 15 onwards.

BRAIN WORKERS' ENERGY OUTPUT.

With regard to the large class of the population earning their living in sedentary occupations, in which the movements of writing are the only muscular exertion involved, whether this consists merely in copying figures or addressing envelopes, or involves obtruse calculations or difficult composition, the most careful experiments have failed to show any increase in the energy output of the body as a direct result of brain work. A brain worker, therefore, requires no more food, as estimated in calories than would correspond to his

basal metabolism, with the 30 per cent extra due to muscular exercise voluntarily undertaken for health or recreation.

The quality of the brain worker's diet requires rather more consideration than that of the bodily labourer. In order that mental work may be carried on efficiently it is essential that the process of digestion should not make too great a call on the energies of the body. The food must be deigestible and moderate in bulk. In the diet of such a man the more expensive animal foods—meat, fish, eggs, butter, etc.,—should form a larger proportion of the total calories than in the case of the man who earns his living by the work of his muscles.

Experience during the war showed that it was possible for men to live and carry on their normal work on a diet very much less than that to which they were accustomed. The basal metabolism is diminished and the individual is more economical in effort. This seems to have been the condition of the greater part of the urban inhabitants of Germany, who received a daily allowance of food of not more than 2,000 calories. When extended over years, however, the general effect appears to be a diminution in the resistance to tubercular disease. In the case of children the effect has been to restrict growth, but not to stop it.

Experiments on animals, as well as German observations tend to show that a return to normal conditions will probably be followed by an increased rate of growth which will be sufficient to make up for that loss during the past years.

ECONOMIC NOTES.

AGRICULTURE.

The Government of Mysore have issued the following order regarding arrangements for supply of ragi and rice to the poor :—

During his visit to the Mysore City on the 15th and 16th instant, the Officiating Dewan inspected the arrangements for the supply of food grains by the Municipality and discussed the food situation generally with the Food Controller, the Honorary President of the Municipal Council and the Deputy Commissioner of the Mysore District.

2. The situation regarding rice is, on the whole, satisfactory. The supply, on account of the recent harvest, is plentiful and grain is freely coming to the market.

There is, however, some difficulty as regards ragi. The Municipal authorities have opened six depots

(One of which is managed by a private merchant) for the sale of ragi, which is issued to ticket-holders at 10 seers per rupee. During February and March about 1,500 pallas were sold in this manner.

But the supply of ragi in the Municipal depots is insufficient and adequate precautions have not been taken to regulate the crowd which gathers at the depots. The ticket system also has not been carefully worked.

3. After discussing the situation with all the officers concerned, the following arrangements have been ordered :—

- (i) Government will have to restrict the food distribution in the City to the poorer classes.
- (ii) Statistics show that to provide for these classes 150 pallas of food grains are required daily. Seventy-five pallas of ragi and seventy-five pallas of Burma rice will be sold daily through 10 distributing depots to persons who have obtained tickets from the Municipal Office.
- (iii) The issue of tickets will be made under a carefully conducted census on the basis of the lists already prepared and the number of tickets, as well as the quantities noted therein, should be regulated with reference to the quantity of grain allotted, that is, 150 pallas per day.
- (iv) Strong iron rails and barricades should be put in each place to prevent rush and danger to women and children, entrance and exits being guarded by Police men, who will insist on ticket-holders only being allowed.
- (v) The supply of ragi will be made at 10 seers a rupee and Rangoon rice at 6 seers a rupee.
- (vi) The Deputy Commissioner, Mysore, will, from now till the end of April, supply to the President a total quantity of 5,000 pallas of ragi according to the detailed* programme laid down to admit of a regular issue of 75 pallas a day, without fail.
- (vii) The Food Controller will send immediately to Mysore about 4,000 pallas of Burma rice to the Honorary President for issue at the rate of 75 pallas per day,

*2,000 pallas (including stock already collected) to be supplied before 20th March, 1919.

1,500 pallas between 20th and 31st March, 1919.

1,500 pallas, between 1st and 15th April, 1919.

- (viii) Daily reports of distribution should be sent to the Food Controller in the following form :—

	Date	Total received	Total in hand	Total distributed	Number of persons
Ragi ...					
Rice ...					

- (ix) One or two additional Food Inspectors to supervise the distribution should be forthwith appointed and necessary police arrangements should be made.

- (x) And bills and tom-tom notices should be widely given announcing the places and the arrangements.

- (xi) All non-ticket-holders should be rigidly excluded.

- (xii) Lists should be carefully scrutinized by Ward Committees to be appointed for the purpose, whose co-operation should be secured for the working of the scheme.

4. The loss entailed by these arrangements will be borne by Government out of the sum sanctioned for the purpose.

The following further order regarding the Distribution of ragi and rice to the poor has also been issued by the Government of Mysore.

Having regard to the acute situation caused by high prices of ragi and the shortage of supplies in the Cities and District Head-quarter towns, Government are pleased to direct that distribution of ragi to the poor in the Mysore and Bangalore Cities and other District Head-quarter towns be immediately organized.

2. In Government Order No. G. 20748-50—P. P. 134-18-428, dated 17th March 1919, orders have been issued laying down a definite scheme for such relief in the Mysore City. The Food Controller is requested to organize a similar agency in the Bangalore City fixing requisite quantities of ragi and Burma rice in consultation with the Honorary President and the Deputy Commissioner, Bangalore District, who is responsible for the commandeering of ragi.

3. Similar action should be taken by the Food Controller in consultation with the Deputy Commissioners concerned, for opening such depots at District Head-quarter towns for sale according to actual necessity. Commandeering should be under the supervision of Sub-Division Officers without exception and the rate fixed according to the prevailing market rate as far as possible, the difference between this and the distribution rate at Government centres being borne by Government.

4. The expenditure under the above scheme will be met by a special grant from the famine reserve.

5. To relieve distress among working classes in rural areas, the Deputy Commissioners are requested to enlarge the programme of village works as far as possible in accordance with instructions given in the Government Order read above. They are also requested to specify the taluks where such relief is most needed and where the rule about raiyats' contributions require to be relaxed.

6. Necessary action may also be taken for opening depots at all Taluk Head-quarter stations for sale of imported rice. Necessary establishments at a cost not exceeding Rs. 30 per mensem for each Taluk Depot that may be opened may be entertained.

FODDER CROPS FOR THE HOT WEATHER.

The Department of Agriculture, Bombay, has issued the following Leaflet (No. 11 of 1918) on Fodder Crops for the Hot Weather :—

During the present famine year the greatest difficulty about fodder both in the Deccan and in Gujarat is likely to be felt from the beginning of May till the latter part of June. It is, therefore, very important to grow fodder crops which will flourish through the hot weather and be ready for cutting at the time stated above.

Such crops are found in certain special varieties of Jowar. *Sundhia* Jowar is the best for Gujarat; *Hundi*, *Kalbondi* and *Khondi* Jowars are the best in the Deccan. *Sundhia* seed is available in freely large quantities in Gujarat, chiefly round Nadiad. An effort is being made by the Agricultural Department to get seed of the varieties suitable for the Deccan, for those who cannot secure it themselves.

In growing these crops, the land should be prepared as for an ordinary *jowari* crop, except that provision should be made for irrigation. As much cattle manure and other refuse manure as can be

spared should be put on the land, and the seed should be sown with a four coultered drill, with nine inches between the rows. The seeding must be thick, and not less than forty pounds of seed per acre should be put in.

Irrigation will have to be frequent, water being applied once in four or five days in the light soils of Gujarat, and once in eight to ten days in the Deccan.

None of these fodder crops can be used without danger until the ears have formed, but after that time they are excellent fodder. *Sundhia Jowar* will reach this stage in about two months: the other *jowars* mentioned will be ready for cutting in from 2½ to 3 months.

The yield of green fodder which will be obtained on fairly good land is from 10,000 to 12,000 pounds of green fodder in the case of *Sundhia Jowar*, and a little more in the case of the other *jowars* mentioned.

DAIRYING.

The Government of Madras have passed orders approving the following proposals of the Director of Agriculture, Madras, for the improvement of dairy business in the Madras City:—

2. A reference is solicited to Bulletin No. 73 of the department—'A Survey of the Madras Dairy Trade' by Mr. A Carruth, the Deputy Director of Agriculture for Livestock—for a description of the existing state of affairs, and to the paper on the *Dairy Trade and its Improvement*, by the same officer, which will be found on pages 198 to 207 of the *Journal of the Madras Agricultural Students Union* for August 1918, for proposals as to how this state of things can be remedied.

3. It is useless to expect any improvement until the industry can be put on an economic basis. And the only way to do this is to find a cow that will produce enough milk to pay for its keep and for some profit to the dairyman. There are no signs of any really good milking strains even in the Ongole breed, which is our best local one. Therefore the solution of the problem must be sought in cross-breeding.

4. I do not think that there is any escape from this conclusion. One is confirmed in it by the fact that the Madras milkmen have already sought to solve the problem on these lines. A large number of the milch cattle in Madras are already cross-bred—but this introduction of foreign blood has taken place in a haphazard manner, and there has been no attempt to breed out a good milking strain—vide

Part VII, page 32 of 'A Survey of the Madras Dairy Trade.' Again the Military have gone in largely for cross-breeding at all Military dairy farms.

5. Mr. Carruth selects the Ayrshire breed as the most suitable for crossing with Madras cows and I think that his conclusion must be accepted. The Military Farms department have imported large numbers of bulls of this breed—I know that at least 30 have been imported in each of the last two years possibly more.

6. Owing to the heavy losses of cross-bred cattle which we experienced at Coimbatore last year, I have hesitated to recommend any scheme which involved cross-breeding. However, as explained in my letter No. R. O. C. 2776-5655-G1., dated 11th December 1918, I am satisfied that in the method of simultaneous inoculation, as worked out in recent years on the Military dairy farms, we have a sure means of combating rinderpest. We must always expect a certain percentage of loss, but this risk must be accepted because cross-breeding is the only way in which we can hope to bring about any permanent improvement in the milking capacity of Indian cattle.

7. I therefore submit the following definite scheme which has been worked out by Mr. Carruth;

- (a) Ayrshire bulls of a good milking strain to be purchased by Government.
- (b) These bulls to be kept at suitable centres in Madras town for the service of the milch cattle of professional milkmen.
- (c) An upper subordinate of this department to be stationed in Madras to look after the bulls and to get into touch with the milkmen.
- (d) In return for the charging of a specially low service fee, the Government to have the option of purchasing the calves at a fixed price.
- (e) These calves to be used to stock a Government dairy farm not too far from Madras, where cross-breeding would be carried on with a view to the production of a stable dairy breed.
- (f) Attempts to be made to start a co-operative society among the Madras milkmen, both for credit purposes, and to encourage them to go in for systematic breeding, co-operative purchase of cattle food, and possibly co-operative sale of milk.

8. The first step to be taken is the purchase of the bulls. Eight bulls will be required altogether if the scheme succeeds. For the present I recommend that four bulls should be purchased this year. They

should arrive at Madras in November next. Mr. Carruth estimates that the bulls will cost £130 each. They should be sent first to the cattle-testing station of the Board of Agriculture and Fisheries, Pirbright. Survey (vide leaflet No. 290 of the Board), for being inoculated against piroplasmosis and tested for tuberculosis. On arrival in this country they should be inoculated against rinderpest by the simultaneous method. Allowing for all charges the four bulls will cost Rs. 12,000 landed at Madras.

The total cost of this part of the scheme may be estimated as follows:—

A. Capital Cost.

	Rs.
(1) Cost of four bulls landed at Madras ...	12,000
(2) Cost of four bull sheds ...	4,000
Total ...	16,000

B. Recurring.

Feeding charges, 150×4 ...	600
Attendants, 15×12×4 ...	720
Contingencies ...	200
Total ...	1,520

These charges would be doubled when eight bulls are kept.

9. It is not easy to estimate the cost of establishing a dairy and breeding farm. The cost of buildings on the Chintaladevi cattle farm is proving much higher than was originally anticipated. Judging by these, the initial cost of such a farm would not be less than two lakhs, while the annual recurring cost would be about Rs. 24,000, but this should of course be largely recouped by sale of milk and stock.

10. If this scheme is generally approved of, I request sanction for the purchase of four Ayrshire bulls this year. A lump provision of Rs. 14,000 has been made in the budget for 1919-20 under 26-A (a) Agriculture III (3) Experimental Farms and Cultivation.

The Madras Government in their order observe:—

The Government generally approve the proposals of the Director of Agriculture for the improvement of the dairy business in the Madras City and sanction the purchase during 1919 of four Ayrshire bulls. The Director is requested to consider and report on the question of the locality for the proposed dairy farm and to submit in due course plans and estimates for the buildings required in that connexion.

2. The attention of the Registrar of Co-operative Societies is invited to paragraph 7 (f) of the Director's letter and he is requested to consider and report, in consultation with the Agricultural Department, on the feasibility of starting co-operative dairy societies and societies for credit purposes among the milkmen in the City as well as in other parts of the Presidency.

EDUCATION.

More State Aid for Universities.

Mr. Fisher, President of the Board of Education, lectured in mail week at Saddlers' Hall, Cheapside, on "The Functions of Government in Relation to Education." The lecture was arranged by the Industrial Reconstruction Council and the Lord Mayor presided.

Mr. Fisher said that the change that would most seriously affect education would be to abolish the local system and have a system centralized in Whitehall, but of all the changes, he thought that was the least likely to occur. The English system of education was not a public system administered locally, like the American, nor a public system administered from a central office, like the German. It had not been framed upon a comprehensive and all including plan, and this complexion of affairs, corresponded more closely with the unanalysed feelings of the average Englishman, who was a born individualist and resented Government interference. They might fairly assume then that with the passing of the Education Act and the Superannuation Act last session, and the reforms in educational finance with which they were accompanied, they had now fixed for some years to come the main outlines of the educational landscape. Many years of strenuous effort, of devoted toil, and of enthusiastic adventure would be necessary before the provisions of the Act of 1918 became part of the flesh and blood of our national life, and it was greatly to be hoped that the cause of good administration would not be impeded by the intrusion of educational controversies which might paralyse action, deflect energy, and divide purpose.

He would not deny that the changes which had been accomplished since he came to the Board of Education two years ago had tended to increase the weight and power of the public as opposed to the private system of education in the country. More money had gone to the teachers, both in the way of salary and in the way of pension, larger grants had been procured for secondary and elementary schools, and it had consequently been made more difficult for the weaker schools, standing outside the State system, and depending upon voluntary contributions, to compete with the schools assisted out of public money. It was hoped that in the near future it might be found possible to increase Treasury grants

to the Universities, to extend encouragement to scientific research in all fruitful directions. Education would undoubtedly work better if the number of local authorities could be reduced, but the administration of more than 300 local bodies was a formidable obstacle to any undue prominence being given to any particular form of education.

AID OF VOLUNTARY AGENCIES.

The State was now about to attempt, under the provisions of the Education Act of last Session, to train the whole adolescent population of the country, but the period to be spent in the new continuation schools, being carved out of the precious hours assigned to industrial toil, would necessarily be short, and must be regarded as a stimulus to education of a voluntary kind rather than a sufficient provision in itself. The new Act would largely fail in its purpose unless supported by all weight which voluntary agencies, whatever their social or religious complexion, could bring to bear on an improved moral, physical and intellectual condition of our young people.

We had now reached a point in educational development at which it became clear that the Universities would be compelled to accept a larger measure of State assistance than had hitherto been afforded to them to meet the needs in certain important branches of scientific development. For instance, trained meteorologists were needed for aviation purposes, trained marine physicists in connexion with submarines, and hydraulic engineers for the proper use of our waterways.

What was the solution to the many problems which presented themselves? He had come to the conclusion that it partly depended upon the intelligent co-operation of the universities themselves, but partly, he thought that intelligent co-operation must be assisted by the gentle and indirect pressure exercised by the distribution of Treasury grants to the universities willing to receive them; and it was his intention, in collaboration with the Secretaries for Scotland and Ireland, to set up a Committee which would distribute grants to universities in the administration of which there would be some opportunity to give counsel to the university as to a particular line of development in the pursuit of which they were most likely to contribute to the commonweal.

It was to be hoped that, in the new educational impulse that was running through this country, the drawbacks he had mentioned might disappear, and that they might witness, in the course of the next generation, the completion of a system of public education preserving all the best elements of their ancient freedom, but combining these with a higher measure of efficiency and a greater comprehension of the many scientific needs of modern life.

FRUIT CULTURE.

Grafting the Grape-Vine.

Mr. H. V. Gole, Grape-Grower, Nasik, writing in the *Tropical Agriculturist* for March, 1919, says:—

Among other advantages of grafting the grape-vine, it is claimed that the effect of grafting is to produce a constant weakening of the scion with increased fructification, a greater number of closely-set bunches with large berries, more juicy and frequently richer in saccharine matter, and an early ripening. Husmann also believes that grafting increases fruitfulness, the temporary obstruction seeming to have the effect upon the graft of making it produce more and finer fruit than on its own roots. He has also recorded similar experience of other eminent growers.

The matter seemed worthy of investigation and led me to undertake a few experiments as already remarked in Bulletin No. 71 (of 1915) of the Bombay Agricultural Department. The principal varieties of grapes grown at Nasik are only four. Bhokari, being a good cropper, is much in favour and largely grown, while Fakari, Sahibi, and Hafsi or Kali, being very shy bearers, are never grown beyond a few vines in a plantation, though these varieties are decidedly superior. If grafting produced increased fruitfulness, the problem here was to ascertain whether some of our shy bearers could be made to yield more and better fruit by grafting them on other stock.

I had no clear notions about the influence of the stock upon the scion. I vaguely imagined that Bhokari, being very prolific, might exert a favourable influence upon the scion. Also, as Fakari, Sahibi, and Kali are very vigorous growers, producing abundant foliage—perhaps at the expense of fruit—I should be able to check this habit of vigorous growth by selecting a stock which was a moderate grower by habit, such as Bhokari. On these considerations, I decided to use Bhokari as stock.

The next point was to select the method of grafting. Various methods of grafting and budding have been suggested. As I had very little experience in grafting, I chose to operate in four different manners, namely:—

- (1) Grafted cuttings,
- (2) Grafting by approach,
- (3) Crown grafting, and
- (4) Side-cleft grafting.

GRAFTED CUTTINGS.

For successful grafting it has been found that the temperature should not exceed 20° or 25°C. As cuttings could only be obtained in the beginning of October, I tried grafted cuttings at this time, though the temperature conditions were not favourable. All the trials failed successively for three years (1914 to 1916). In preparing the graft, the cut has to be made one-half to one inch above and below a node upon the stock and scion respectively. This left the knitting surface much too small. The grafted cuttings should have been kept for callusing in fresh moist sand before they were set to root. I admit that I had not followed this instruction. Be it from whatsoever cause, none of the grafted cuttings rooted, and I gave up the trials after three years.

GRAFTING BY APPROACH.

In 1913 a *mali* from the Ganeshkhind Botanical Gardens, Kirkee, grafted on two Bhokari vines in one of my plantations, operating by the usual method of grafting by approach (tongue graft). Both the grafts knitted well and were successful. Fakari canes were used for scions. Both grafts were pruned in April, 1914, to form the head. One of the grafts was accidentally destroyed while ploughing. The other graft was again pruned for fruit in October, 1914. The stock of this graft is 40 in. long and the scion after heading in was 24 in. long. It gave six bunches of good size, while there were only four small bunches on the parent vine, that is, from which the scion was taken. The result was tolerably fair and encouraging. This graft is bearing splendidly every year.

I have found that grafting by approach is a much surer method—the grafts knit well and the chances of failure are few. I have other grafts prepared by the approach method. One is bearing fruit beautifully. The length of the stock is 24 in. and that of the scion after heading is 40 in. Three other grafts had to be transplanted elsewhere in April, 1917, as they happened to be in an isolated condition, but they have not as yet recovered from the shock.

But there is one disadvantage with this method. As the number of vines for the scion is only limited in a given plantation, only a few vines can be grafted by this method. I thought of trying a method which shall be quite independent of the position of scion vines, which is described below.

CROWN GRAFTING AND SIDE-CLEFT GRAFTING.

In October, 1914, I tried 10 crown grafts and 10 side-cleft grafts. Four crown grafts were put below the ground and the rest above the ground. Only one graft above ground knitted well and was successful. Again, in the following year, out of nine

crown grafts and nine side-cleft grafts, only one crown graft above ground was successful. The trials in 1916 and 1917 failed to give even a single successful graft. From this it appears that crown and side-cleft grafting are much more difficult and cannot be practised as a general method.

So far my object had not been attained. I wanted to find out a method of grafting by which the variety of any existing plantation can be changed at will. A new plantation can be put up by growing together and training mixed cuttings of different varieties, and when the heads are formed, the choice variety may be grafted upon another stock by the approach method. I have obtained a few grafts in this manner. But it takes up much time to train the vines before they can be grafted upon and, therefore, foreign varieties cannot be propagated rapidly by this method, nor can their possibilities judged within a short time. Crown and side-cleft grafting have a greater significance in the case of untried and foreign varieties; for, by these methods, these varieties can be introduced rapidly and their possibilities judged.

RESULTS.

As a general rule, Fakari vines on their own roots bear quite indifferently. They will not bear fruit at all or bear a few bunches which are quite out of proportion to the large bearing surface on the head of the vines. All the grafts are bearing fruit regularly from the second year. The quantity of fruit will depend on the bearing surface. As the age of the grafts advanced, the heads were well formed and the bearing surface had increased. There was a corresponding increase in the number of bunches and the weight of the fruit. I am writing this from my observations. I have not kept regular records. Last year the weight of fruit on the graft (approach graft of 1913,) must have been 15 lb.; the other approach grafts yielded nearly seven pounds of grafts bore quite to my expectation. This year the approach grafts of 1913, had 42 bunches, which weighed 22 lb. (Birds are responsible for considerable loss of weight; only actual weight is given.) The other approach grafts had 19 bunches which weighed 14 lb. The number of bunches on the crown graft of 1914, was 17 and weighed 7½ lb., while the other crown graft of 1915 gave 13 bunches which weighed 6 lb. The bunches on both the grafts were mildewed, which circumstance has adversely influenced the weight. Many of the bunches were of large size. The berries attained normal size. On the other hand the berries on some bunches were undersized. Near each crown graft (close to it) is a companion or sister Bhokari vine which is also in bearing. In one of my plantations there are 150 Fakari vines on their own roots.

They bear fruit indifferently and are not even paying the cost of their cultivation. This is the first time in five years that they have borne fruit to an appreciable extent. The total weight of fruit on these 150 Fakari vines was 196 lb., or a little less than 2lb. per vine. The average yield from Bhokari vines is 12 lb. to 15 lb. Individual Bhokari vines do bear 20 lb. to 25 lb. of fruit. From these figures it will be seen that the grafts gave considerably increased quantity of fruit, far in excess of the average of 2 lb. on the 150 Fakari vines on their own roots.

CONCLUSION.

It appears that grafting the grape-vine increases fruitfulness. The grafts give larger and closely-set bunches. In some bunches the berries attained normal size, while in others they are undersized. The quality of the fruit is not changed appreciably. From the behaviour of four grafts, it is not safe to assert, as a general proposition, that grafting produces fruitfulness. The indications are, however, that it does produce increased fruitfulness. More experimental work is necessary. Experiments generally do not pay and are even costly. In other experiments with the grape-vines—such as summer pruning or pinching and spraying with ammonia copper carbonate solution against mildew—I have gained: while in trying the crown grafts, I have lost 40 well-established vines and permanently injured 40 vines by side-cleft grafting. Besides, such experiments in experienced and capable hands are likely to be more successful. If the record of my experiments be deemed interesting, I hope others will undertake further experimental work.

Next cold weather, I shall grow and train 60 sets of mixed cuttings. Every set will consist of 4 cuttings, two of Bhokari and two of choice variety. Bhokari will be used for stock. For the scion, cuttings of Fakari, Sahibi, Kali and Kandabari will be grown.

When the vines are established and heads are formed, I propose to graft the choice varieties by the approach method.

FOOD AND FOODSTUFFS.

Guinea Grass Cultivation.

The following Government Gardens Department Food Production Pamphlet (No. 2) dealing with the cultivation of Guinea Grass (*Panicum Maximum*) has been issued:—

INTRODUCTION.

Guinea grass is a native of tropical Africa, and is now cultivated in many hot countries. It is a

perennial and drought resisting grass. It yields a nutritious fodder which is liked by dairy animals, bullocks and horses.

Guinea grass is propagated by seeds or root-stocks. It could be grown either as an irrigated or rain fed crop. It grows well in shade (especially under mangoes) and on even slightly water-logged soils. It thrives on almost any kind of soil.

PREPARATORY CULTIVATION.

The soil should be made friable by ploughing and harrowing, or by digging, and breaking clods. It is desirable to apply about 30 cart-loads of well rotted farm-yard manure per acre before planting.

SOWING.

If seed is used, it should be sown in well prepared seed beds. When the seedlings have produced three or four leaves, they should be transplanted 3 feet apart each way. The quantity of seeds required for an acre is about 3 lbs. If root-stocks are planted, five or six of them should be planted in a clump 3 feet apart each way.

IRRIGATION.

The crop should be irrigated once in about 10 days during dry weather.

AFTER CULTIVATION.

The field should be frequently stirred and weeded, and it should be top dressed with the farm-yard manure after every third cutting.

YIELD.

The yield of green grass per acre under irrigation, is about 50,000 lbs, or about 22 tons per annum. Under sewage irrigation, an acre has given over 200,000 lbs. of green grass per annum. The grass should be cut close to the ground at the first cutting which will be about three months after planting. Subsequent cuttings are made at regular intervals of a month. The crop needs renewal once in three years as the quality and quantity of the yield declines after that period.

PROFIT.

The cost of cultivating an acre of the grass is about Rs. 100 and the value of the crop at Re. 1 per 100 lbs. of green grass is Rs. 500 per annum approximately.

CONCLUSION.

About three pairs of dairy animals can be supported for a year on the produce of an acre.

PUBLIC HEALTH AND SANITATION.

The following order on the reorganization of the Public Health Department has been issued by the Government of His Highness the Maharaja of Mysore:—

Under the arrangement sanctioned in Government Order of the 8th February, 1917, read above, a full-time Sanitary Commissioner is now at the head of the Public Health Department with two Assistants for the work of the Public Health Laboratory and the Superior District Sanitary Service consists of a separate District Sanitary Officer for each of the Districts of Mysore, Hassan, Shimoga and Kadur and *ex-officio* District Sanitary Officer for each of the remaining districts. There are in addition the three Health Officers of the Cities of Bangalore and Mysore and the Kolar Gold Fields paid by the

respective Local Bodies. It is found by experience that the existing staff is inadequate for the growing requirements of the Department. A sufficient reserve of trained officers is required for employment in emergencies in connection with the prevalence of epidemics and arrangements have also to be made for enabling the District Sanitary Officers to keep in touch with up-to-date scientific knowledge by working in the Public Health Laboratory from time to time. The present scale of pay of the superior staff likewise needs revision and has to be brought into line with that of the Medical Service as recently organized, in order that men with the requisite qualifications may be attracted to the Public Health Department.

2. Having regard to the considerations mentioned above, Government are pleased to revise the strength and scale of pay of the staff of the Public Health Department including the three Health Officers as follows:—

No.	Designation	Pay	Remarks
1	Sanitary Commissioner	1,000	.....
4	Three Health Officers and one officer in charge of Public Health Institute and Office Assistant to the Sanitary Commissioner.	400—30—700	Pay of Health Officers to be borne by the Local Bodies concerned.
7	Four District Sanitary Officers, one Assistant to the Public Health Institute and two officers (reserve).	150—15—360	One-third of the pay of the District Sanitary Officer to be met by the Local Boards and Municipalities.
4	Sub-Assistant Surgeon (reserve)* ...	45— ¹⁰ / ₅ —65	*Pay of the two reserve officers on Rs. 150-15-360 and four Sub-Assistant Surgeons to be met from the lumpsum provision of Rs. 25,400 for plague charges.

3. There will be a District Sanitary Officer for each of the two Districts as grouped below. The District Medical Officers, where they are now holding the District Sanitary charge as well, will be completely relieved of this *ex-officio* function. The District Sanitary officers will be responsible for the sanitary administration of their respective districts and it will be one of their important duties to offer advice and assistance to the Local Boards and Municipalities in all sanitary matters.

Mysore and Hassan.
Tumkur and Chitaldrug,
Bangalore and Kolar.
Shimoga and Kadur.

4. The Sanitary Commissioner is requested to submit detailed proposals for giving effect to the

arrangements herein sanctioned consistently with the objects in view.

5. The two temporary appointments sanctioned in Government Order No. 6005—6—San. 59-17-13, dated the 27th April 1918, will be absorbed in the scale as now revised.

6. As regards the Vaccine Institute recently transferred to the control of the Sanitary Commissioner, in Government Order No. 526-31—San. 126-17-6 dated the 20th August, 1918, the existing scale of establishment will continue for the present.

7. The question of attaching a public works staff to the Public Health Department is reserved for separate consideration.

CO-OPERATION IN MYSORE.

Mr. R. Ranga Rao, Registrar of Co-operative Societies, in a paper to the Eighth Conference of Registrar of Co-operative Societies, says :—

The following statement compares the Progress of the Co-operative movement in Mysore during 1917-18 with that during 1916-17 :—

	Number of Societies	Member-ship	Share Capital	Deposits	Loans	Total Transactions	Net Profits	Reserve Fund
1916-17	974	75,000	25,00,000	17,50,000	12,00,000	2,15,20,000	2,63,000	2,35,000
1917-18	1,100	82,000	30,00,000	20,00,000	15,00,000	2,60,00,000	3,05,000	3,20,000

The rate of progress was below that of previous years. This was not due to the War which had scarcely any effect on the movement as a whole except to slight extent with regard to Weavers' Societies. The diminished rate of progress was due to greater attention being paid to consolidation of existing societies than to their expansion. Special measures were adopted for the recovery of loans. An examination was made of the principles on which loans were granted and recovered. As a tendency was noticed on the part of the Committee members of some of the Societies to monopolise loans, a rule was passed by the Government limiting the loans admissible to the Committee members of a Society to 25 per cent of the total loans granted by the Society. An investigation was instituted into the condition of the members of Co-operative Societies with a view to find out how far they had been benefited by their membership. The investigation has been completed in only 40 Societies and the results, on the economic side, show that while the total indebtedness of the members has not materially decreased, their total assets have substantially increased.

The following statement shows the varieties of Societies in Mysore :—

Primary non-agricultural credit Societies	...	70
Primary agricultural credit Societies	...	900
Central Banks, Unions, etc.	...	20
Societies for manure supply	...	3
„ the supply of agricultural implements	...	3

Societies for lift irrigation	...	2
„ sandal-wood carvers...	...	2
„ ivory inlayers	...	2
„ toy-makers	...	2
„ weavers	...	22
„ rice hulling and jaggary making.	10	
Stores	...	20
Grain Banks	...	25
House Building Societies	...	4
Societies for backward classes	...	15

It will be noticed from the statement that the bulk of the societies in Mysore are credit institutions. But there is general desire on the part of the people to apply co-operative principles to several agricultural and industrial purposes. Apart from the special societies mentioned in the statement above, many of the credit societies undertake the supply of manure, seed and agricultural implements to their members. So far, however, their efforts in these directions have not been specially successful nor fully organized. But the work has now been taken up and a considerable expansion of Agricultural and Industrial co-operation, side by side with the development of the credit movement may be soon expected.

The question of forming an Apex Provincial Co-operative Bank, which has been and is being discussed among co-operators all over India, was taken up in Mysore a little over two years ago. A Central Bank, which was started in 1908, was serving some of the purposes of an Apex Bank, but as it was considered to fall short in some respects of the ideals of a Provincial Bank, a new Apex Bank was started

some time ago. It received considerable encouragement on all sides and developed rapidly. As, however, it is distinctly inconvenient to have two Provincial Banks serving the same area and it leads to a waste of efforts, efforts are now being made to amalgamate the two under a suitable constitution.

The prominence given to the redemption of prior indebtedness forms a principal feature of the working of the agricultural credit societies in Mysore. Accurate figures are unfortunately not available, but out of a total credit of about 120 to 150 lakhs granted by these societies, about 50 lakhs have been utilized for the repayment of prior debts. With a view to still further increase this branch of their work, the societies are, as already stated, conducting a survey into the economic condition of their members. But the large amount of money required and the long period for which it will be required are likely to offer serious difficulties.

The Mysore Co-operative Societies Regulation, which was passed in 1905, was amended this year. The old regulation contained several provisions which were introduced into British India in 1912 and it has now been remodelled entirely on the lines of the British India Act of 1912.

The Staff of the Co-operative Department was recently revised and consists now of a Registrar, two Assistant Registrars, a Personal Assistant and an adequate number of clerks and inspectors. A third assistant Registrar will soon be added.

The seventh Mysore Provincial Co-operative Conference was held at Mysore in October, 1917. Also eight District and fifty Taluk Conferences were held during the year.

Among the improvements which it is proposed to introduce in the near future may be mentioned the formation of a non-official agency to take up the work of the Co-operative Education and propaganda, the training of men employed on Co-operative work, the creation of an audit and supervising staff paid for by the Societies themselves and the entrusting of village sanitation, village education and village improvement to Co-operative Societies. These subjects are under active consideration and early measures are likely to be adopted.

BOOKS IN BRIEF.

The War and Social Reform—By W. B. Worsfold. John Murray, London. 6sh. net.

It is gratifying to note that the number of books on the question of better relations between employers and employed is steadily increasing in England. The actual example of co-partnership in certain places and the need for increased out-put both in industries and agriculture may be held to be primarily responsible for the growing desire for a rapprochement between capital and labour. To whatever cause due, it is an encouraging sign of the times. Mr. Worsfold traces in this book the influence of war as a reforming agency, with special reference, we may add, to matters primarily affecting the wage-earning classes. His is a constructive book. He has no misgivings of the good effects of the Education Act of 1918 but he wants the nation to be prepared to meet the conditions that will be created by it in the years to come. "We must look to it in the immediate future," he writes, "to find work for the gifted children of the manual labourers, both skilled and unskilled, whom the Education Act, with other measures of social reform, will transfer in gradually increasing numbers to the ranks of the trained workers; and we must look to it, too, in the great consummation of the issues of the war, to remove the burden of those grosser bodily tasks which hitherto have oppressed the mind of the great majority of mankind, and robbed them of their due share in life's noblest pursuits." Mr. Worsfold, in a word, is a firm believer in the new Education Act. He speaks warmly of the spirit underlying it. "The principles and methods which it embodies are not new; its main features are drawn upon lines long familiar to workers in education. What is new is the national spirit which has made it possible to put such a measure upon the statute book at a time when our energies were so resolutely directed to the work of war." What is this new spirit he speaks of? It is, in one word, the affording the opportunity to the child of poor and rich alike, the benefits of education. Mr. Worsfold sees nothing but good in the participation of labour representatives in the administration of public affairs. He sees in it a sure sign of what is coming: the refashioning of English national life by forces not of destruction but of construction, thus adding to the strength of the body politic. In a chapter of great interest on social reform, Mr. Worsfold unfolds, what has been done and what yet remains to be accomplished. He ends it with a section on housing which we would recommend every one interested in the subject in this country to read. He calls it a "grave matter" and rightly so. The same question is forcing itself to the front in India and it requires attention at the hands of the Central Government in India so that it might start on a firm and sound basis. Mr. Worsfold believes—and we think rightly—that increased production and social reform can go together without detriment to each other. He has no doubts that science and

mechanical power can do much to save human labour. "Everything goes to show," he adds, "that the years immediately succeeding the war will inaugurate an era in which science and engineering skill will apply mechanical power to the service not alone of industrial production, but of men's everyday needs, with increasing variety and effect. Machinery will be purged of the reproach which William Morris brought against it. The utilisation of mechanical power and appliances will be directed consciously not to the saving of wages, but to helping the labourer to earn his wages; and thus employed it will raise the productive capacity of all human effort physical and mental." In the Appendix to his volume, Mr. Worsfold inserts an analysis of the *Cosmos* scheme of co-partnership of capital and labour, which is noticed below. He may be taken to view with favour the proposals adumbrated in *Cosmos* for his detailed examination of the scheme discloses more points of agreement than of disagreement with its author.

Industrial Situation After the War.—*Revised and Enlarged Edition.* Harrison and Sons, St. Martins Lane, London, W. C. 2sh. net.

The popularity of this memorandum issued under the auspices of the Garton Foundation is indicated by the rapidity with which the first issue (10,000 copies) was exhausted. The memorandum is, perhaps, the keenest analysis yet issued of the industrial situation to-day in Great Britain. Its constructive part aims at reconciliation between capital and labour without which increased production is impossible. It has been the object of the authors of the memorandum to keep always in mind the human as well as the economic side of industry. They are conscious that this country (Great Britain) has suffered much in the past from the habit of sectional thinking, which divides our national activities into water-tight compartments and regards the nation itself as composed of detached or hostile classes. The keener consciousness of corporate life, which is perhaps the most beneficial result of the present struggle, has created an atmosphere in which it is easier to conceive of industry as an inseparable part of the life of the nation; and of those concerned in industry, whether as employers or employed, as co-workers in the task of building up a future worthy of the sacrifices which have been made during the war." The memorandum itself fully bears out this conception of their duties. It is divided into five sections dealing with (1) the industrial situation to-day; (2) the effects of the war in the industrial situation; (3) the problem and some remedies; (4) the fundamental problem; and (5) joint industrial councils and trade boards. Under each head, the authors set out in dispassionate language what they deem necessary for a proper understanding of the existing situation and suggest remedies wherever necessary of a useful character. Whatever the merits of individual schemes of reconciliation between capital and labour, it cannot be denied that increased production, increased savings, and increased confidence are the keys to the present industrial situation. Production itself is dependent on friendly relation between employers and the employed and the need of the hour is a reconciliation between the two. The authors of the Memo show that such a reconciliation is possible and is necessary in the interests of the nation. Will those to whom the memorandum is primarily addressed listen to the advice given? That is the only point at issue.

Cosmos: A Scheme for Industrial Co-operation between Capital and Labour.—*Edited with an introduction by Douglas Sladen.* Horace Cox: Breams Buildings, London, E. C.

Whoever the author of this pamphlet—and he is known to be a "Great Coal-owner"—he deserves praise for the constructive scheme he has put forward in it. It is a scheme that strikes us as being eminently fair to employers and employed. It is principally to be welcomed for the suggestions it contains for getting at the fundamental cause of all labour interest—antagonism between capital and labour. The author's scheme has obvious advantages to both parties and ought to be welcomed by all interested in ending labour troubles. If increased production is necessary in the coming years, some such scheme as this should be adopted by both parties. This has the merit of being both simple and serious. The spread of labour organizations in India is likely to be followed with conflicts in the future between the two arms of production in this country as well. It is good, therefore, that those wishing well of labour in India should keep close watch over the development of the co-partnership movement in Great Britain and, if possible, extend its benefits to this country at an earlier stage than has been possible in England. To social workers, we cannot recommend a better pamphlet than that we are writing of. It is written by a convinced believer in co-partnership and that is, perhaps, its highest merit.

RECENT PUBLICATIONS.

The Tragedy of Milk Production. *Being letters addressed to Members of the British Parliament and the Press, of invaluable use to the general public specially interested in child welfare.* By Robert Wallace, Professor of Agriculture and Rural Economy; Edinburgh University. $8\frac{1}{2} \times 5\frac{1}{2}$, 40 pp. Edinburgh. Oliver and Boyd. 6d.

The Fiftieth Annual Co-operative Congress, 1918. *Held at the Central Hall, Liverpool.* Edited by A. Whitehead. $8\frac{1}{2} \times 5\frac{1}{2}$, xxxvi. + 880 pp. Manchester Co-operative Union.

The Taxation of Capital. By Sir Alfred W. Soward, C. B., and W. E. Willan, Solicitor. $8\frac{1}{2} \times 5\frac{1}{2}$, xvi. + 408 pp. Waterlow. 18s. n.

The Human Machine and Industrial Efficiency. By Frederic S. Lee, Dalton Professor of Physiology, Columbia University, etc. $7\frac{1}{2} \times 5$, vii. + 119 pp. Longmans. 5s. n.

Industrial Re-construction and the Metric System. By Harry Alcock. $8\frac{1}{2} \times 5\frac{1}{2}$, 8 pp. Decimal Association.

Education Authorities' Hand-book. *A digest of the Education (Scotland) Acts, 1872 to 1918, with the text of the statutes and an account of the statutory powers and duties of education authorities and school management committees.* By G. N. Morrison, $8\frac{1}{2} \times 5\frac{1}{2}$, xv. + 298 pp. W. Hodge. 10s. 6d.

New Town. A Proposal in Agricultural, Industrial, Educational, Civic, and Social Re-construction. Edited by W. R. Hughes. $7\frac{1}{2} \times 4\frac{1}{2}$, 141 pp. Dent. 2s. n.

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UNIVERSALISING SECONDARY EDUCATION.

BY THE EDITOR.

THE movement for free Secondary Education in Great Britain is fast growing. In Canada and Australia all education is practically free from the Primary to the University stage. The system of free public schools all over the United States is well known. Such schools are a feature of the education system of the United States. So important is this system of free education considered in the United States that these free schools in the States forming the Union have a statutory basis. According to law no State can be without such schools for the benefit of the people of the State. To make Free Education possible even in new States, the Federal Government has taken care to set apart for elementary schools, in each of them, from two to four 'sections' (or square miles) in each township six miles square, the proceeds from the sale of which form the chief part of the permanent school funds of those States, the income alone being used for the support of the schools. This income is supplemented by local taxation so that it constitutes about 3·3 per cent of the total school revenue of all the States. The gradual wiping out of illiteracy in the States by this and other means (such as

private and parochial schools) may be seen in the following figures :—

Year.	Percentage of illiteracy in the pop. above 10 years of age.
1880	17 per cent
1890	13·3 „
1900	10·7 „
1910	7·7 „

This 7·7 per cent is made up as follows :—

Native whites	3·0
Foreign whites	12·8
Coloured	30·5

The coloured people in the Union are about a little over ten millions, of whom two-thirds are literate; the foreign whites total something like 13½ millions, of whom about only 1½ millions are unable to read and write; and the native whites who number 68½ millions and thus form the bulk of the population are practically all literate. It is no exaggeration to say that before very many years elapse illiteracy will be a thing of the past in the United States, whether among the whites or the coloured people. The system of free public schools and the many facilities given to boys to learn to read and write will make soon literacy practically universal in America.

The effect of free education in the colonies in wiping out illiteracy has made itself felt in England. At the last conference of National Union of Teachers held at Chel-

tenham, the executive's resolution on Mr. Fischer's Education Act asked *inter alia* for the extension of the compulsory clauses for the continued education of adolescents and for making secondary education entirely free. As the *Times* correspondent puts it in his report, the conference desired stronger meat than that offered by the resolution of the executive. One member—a new acquisition to the executive—demanded free education right up to the University, together with adequate maintenance grants for all pupils. Mr. W. P. Folland, the new President of the Union, in his vigorous address struck the same note—the vital importance of education and the necessity of helping and safeguarding the teachers in every grade. He pleaded for free and open secondary education, for giving to every child the opportunity to have his abilities fully trained, for substantial salaries to teachers, and for conditions of service that make for efficiency and happiness. So the wave for free secondary education is beating high. The demand for it in England shows that the movement is gaining in volume and strength. Before long it will be recognised that every State should, as part of its bounden duty, provide for the free educational advance of its citizens, rich and poor alike. Education, in other words, will be regarded in the future as more a State than a parental duty.

The argument that primary education should first be made free and compulsory before universalising secondary education is fallacious inasmuch as modern educational theory and even practice does not accept primary education, corresponding to though not higher than the education imparted in what are called elementary schools in England, as any education at all. This view is no doubt comparatively new to England but is now becoming more and more familiar there. The old view which asked the generality of children to rest content with the education given in elementary schools and made secondary education

possible only to a few was condemned at the conference referred to above. It was attacked as a thing educationally unsound. Commenting on this, the *Times* (Educational Supplement dated 1st May) wrote as follows:—

"We have a good deal of sympathy with his view. Why should certain children from Elementary Schools be sent to Secondary Schools, and others not less intellectually competent, and sometimes more competent, be sent to the schools of the higher elementary type? Is it a fact that the children sent to the central schools are intended to supply the labour market, while the secondary are to supply the professions? If there is any such intention underlying the scheme, it is certainly undemocratic and as certainly unsound from the point of view of national education. But the truth of the matter is that these schools are a product of the 1870 conception of Education for the people, a conception which we believe to be largely unsound. There ought not to be elementary schools at all. There ought to be preparatory schools from which every child should be transferred to the appropriate type of secondary school at the age of eleven. No doubt it can be argued that the central school is a transitional device leading in this direction. But meantime we are going to waste half a dozen generations of school children in the process. The National Union of Teachers sprang out of the old elementary system, and a percentage of its members cling to the old elementary ideal. The conception of universal secondary education, which in fact is accepted as a sound position in America, is still not fully accepted by the Union, which rejected Mr. Gauntlett's views by a large majority. Ten years ago the conference would not have listened patiently to these views. Last week the stalwarts of the elementary conception of education had to fight hard for their position. In less than five years we venture to prophesy, Mr. Gauntlett's view will be a common-place of the profession. It is interesting to note that Germany made exactly the same mistake as England. Her folk-schools were and indeed still are, even more thoroughly cut off from Secondary Education than our Elementary Schools. But the type is the same; a special education for a special class, that class forming the vast majority of the children of the country. The doctrine of the Universal Secondary Education does away with this distinction and should give every child the education best suited for the unfolding of his or her personality. Central schools and compulsory day continuation schools are steps in the right direction, but they are mere transitional phenomena."

The primary stage is thus held to be no stage at all in education; to regard it as a distinct stage in itself is to create a stumbling block to ourselves. Educational views filter down slowly to the people of any nation; but that is no reason why they should not be assimilated by experts and incorporated into their every day thought. That would help to create a new atmosphere and progress would be more marked. The change of views in England, though slow, is still a notable one. The sounder view, prevalent in America and on the continent of Europe that primary schools should only be treated as preparatory schools from which every child should be transferred to the appropriate type of secondary school at the age of eleven is coming to prevail. And it is to be hoped that that view, which is now in possession of the educational field everywhere in the civilized world, will also be eventually adopted in this country. If this were done, much of the prejudice now existing against universalising Secondary Education and making it free would soon disappear.

In this country, public opinion has still to be educated in this matter. The need for pressing home this vital matter is great. Persistent attention should be given to it by those interested in the development of the country. Without education, industrial advance is impossible; without education, agricultural improvement is impossible; and without education sanitary improvement is impossible. If the parent is either ignorant or careless, no doubt he suffers for it, but the State of which he is a citizen or subject suffers ten times worse. That is the reason why education has slowly but steadily come to be recognized as a duty of the State *qua* State. Every child—of whatever caste, creed or colour—should be afforded the fullest opportunity to develop the faculties given to it by God. That is coming to be realized as the prime duty of every civilized Government in the world. Can any country hope to sail against that current? The

answer is obvious. President Wilson not long ago said: "The nations are renewed from the bottom not from the top; that the genius which springs up from the ranks of unknown men, is the genius which renews the youth and energy of the people. The utility, the vitality, the fruitage of life does not come from the top to the bottom: it comes like the natural growth of a great tree, from the soil, up through the trunk into the branches, to the foliage and the fruit. The great struggling unknown masses of the men who are at the base of everything are the dynamic force that is lifting the levels of society." Without education, where could these masses be? And what is the loss to a people who cannot afford to provide facilities for mental improvement for them? That is really at the bottom of the *free* education movement, all the world over.

It is thought that with the coming of Peace the paper industry will be extensively promoted. From paper tissues all possible articles one can think of are made, as overalls, table-cloths, curtains, handkerchiefs, collars, shirts, embroidered blouses, hangings for the wall, and imitations of Persian carpets. One German firm made a complete set of horse's harness out of very strong tissue made of a web of from 3-5 woven thickness. This web was strengthened with a mixture containing tar to give it greater resistance. In order to convince the public as to the washing qualities of paper yarn, a section was fitted up where paper articles were washed and boiled before the eyes of the onlookers. It was shown that a stocking, after being washed several times, was softer and thicker than when it was first new.

REPORT OF THE INDIAN COTTON COMMITTEE.

BY A. K. YEGNANARAYANA IYER, M.A.,

Deputy Director of Agriculture, Mysore.

THE Indian Cotton Committee, whose report has just been issued, was appointed by the Government of India in September, 1917, to enquire into the possibility of extending the cultivation of long stapled cottons in India. The terms of reference were the following:—

“The Committee will examine the work which has been done in the various Provinces of India in the establishment of long stapled cottons. It will report regarding the possibility of the extension of any methods which have led to success. It will investigate the causes of failure where this has occurred, and if it finds that the failure has been due to Agricultural, Irrigational or Economic causes or to administrative difficulties, will propose appropriate remedies. It will carry out a detailed study of local conditions in each cotton growing tract and will enquire into the possibility of improving existing methods of ginning and marketing and also of preventing adulteration and damping. It will further report on the possibility of improving the accuracy of the cotton forecasts and generally of making the statistical information published by Government of greater utility to the cotton trade. Finally, it will submit recommendations in regard to the staff required and organization necessary for the development of the cultivation of long stapled cottons in tracts which it considers suitable for that purpose.”

Cotton for Lancashire.—The circumstances which called the committee into existence are pretty much the same as have led the Government of India on more than one occasion in the past to take active

measures for the improvement of Indian Cotton and the extension of its cultivation, viz., the desire to make Lancashire independent of supplies from outside of the Empire. Among the many problems of reconstruction that have been exercising the forethought of the Government during the stress of War, this important subject has not been omitted. The cotton crop of America on which Lancashire has been depending very largely is being absorbed more and more by the rapidly expanding cotton industry of America itself. In the quinquennium 1890-95, the American consumption of cotton was 33 per cent of its total production. In 1910-15, it rose to 39 per cent and in the three years 1915 to 1918, it rose to 59 per cent implying no doubt a corresponding shrinkage in the amount of cotton available for export to the United Kingdom. “It is obvious,” the Committee says, “that the Lancashire Cotton Industry, the importance of which to the Empire needs no comment from us, is faced with a serious situation and that it is most desirable that it should cease to be almost entirely dependant on a source of supply, the future of which is so problematical. India as the largest cotton producing country in the Empire and the second largest in the world clearly offers the greatest possibilities of any considerable increase in the supply of cotton in the near future.”

Indian Interests Predominant.—Such a clear statement as to the main object of the Committee's enquiries may easily lead one to believe that the interests of Lancashire have been the main concern of the Committee and that its recommendations centre mainly round this question. It happens, however, that the question of long staple cotton occupies quite a secondary place in the recommendations and that the main enquiry deals with the whole question of the improvement of the cotton industry in all its aspects, principally in the interests of the Indian cultivator. “To avoid all

possibility of misconception, we would wish here," states the Report, "to emphasise that our primary consideration throughout has been the interests of the Indian cultivator." We are glad to note that the report bears ample testimony to this statement. We may specially refer to the Committee's recommendation regarding the cultivation of "roseum" cotton in the Central Provinces, a cotton of poor and coarse staple, but strikingly high in ginning percentage, and found more profitable to the cultivator than superior varieties. As far as the cultivation of long staple cotton is concerned, the Committee concludes that "India cannot, for at least ten years, grow cotton in any large commercial quantity of a staple longer than $1\frac{1}{16}$ th of an inch." The only important addition to the production of this cotton which they anticipate is an area of 400,000 acres which would come under irrigation, if the Sukkur Barrage Project in Sind is taken up for execution—a conclusion which would no doubt be considered disappointing by those who look to India for a large supply of long staple cotton. It may be also noted that the flourishing cotton industry of India itself absorbs the bulk of the cotton grown in India, the export of Indian cotton to the United Kingdom being only about 4 per cent of the total cotton produced in India. It is stated too that the average yield per acre of the Indian crop is only 85 lbs. of lint, while that of United States crop is nearly 200 lbs. per acre and of the Egyptian crop, 450 lbs. It has been estimated that Indian cotton is so badly marketed that it loses about 10 per cent more in the blow room than American or Egyptian, thus reducing the yield per acre to less than 75 lbs. The existing practice regarding the sale of the cultivator's cotton and the frauds perpetrated in the ginneries and cotton presses result in losses to the producer on the one hand, and to the mills which finally make use of the cotton, on the other. All these facts to which the

enquiries of the Committee have been directed mainly concern themselves with the interests of India itself.

The Committee deals with the whole subject under two sections: (1) Agricultural and Irrigational, and (2) Commercial. We shall follow this scheme in this brief review.

I. AGRICULTURAL AND IRRIGATIONAL.

Indian Long Staple Cotton and Irrigation.—The long staple cottons of India are, the *Karinganni* cotton grown as a dry crop on the black cotton soils in the Tinneveli District; Cambodia cotton, when grown as an irrigated crop; the American cotton varieties also grown under irrigation in the Punjab; the Egyptian cotton—the *Mitaffafi*—the successful cultivation of which under irrigation in Sind has been demonstrated fully in recent years. The long staple cottons, therefore, principally depend upon irrigation and any extension of the area under them can be looked forward to only with improvements in existing irrigation sources or with the opening of new ones. The problems of irrigation as they effect this question are, therefore, gone into somewhat in detail under the head of the various Provinces. The important Irrigation Project in Sind called the Sukkur Barrage Project comes in for considerable attention. We note that the Committee recommend the prohibition of rice growing in the area which may come under irrigated cultivation under this project and the raising of the water rate for rice growing in the old areas in this tract, with the object of encouraging cotton cultivation. Readers acquainted with the proposals for the encouragement of sugar-cane cultivation under the Cauvery Channels in our own State may detect a similarity of ideas in the above recommendations. The Committee have gone into questions of colonization, prevention of Malaria, lining of irrigation channels, water logging, alkali reclamation, and so on. Limited thus by facilities for irrigation, any increase in the

cultivation of long staple cottons can only be slow and even at the most sanguine expectation, only moderate.

Manuring and Increased Yield.—On the question of the raising of the outturn per acre of Indian cotton, both long staple and others which is at present so deplorably low compared with yields abroad, the Committee's recommendations are somewhat meagre. Nitrogen manuring increases the yield, but there is not enough manure to go round for the different crops of the country and the yield of cotton which can no doubt be doubled by proper manuring suffers an account of the general deficiency of manure in the country. We wish the Committee whose opinion is sure to carry great weight with bodies whose interests may often be conflicting, had made some specific recommendation on this general question. The growing of a leguminous fodder crop in rotation with cotton has been recommended, but the claims of a food crop like *juar* will be too great to admit of such; in fact when some years back the writer tried to introduce the cultivation of dry land lucerne in the black cotton soils, it was met with strong objections. We are sure that if the British Cotton Growing Association or other body interested in Indian Cotton turns its attention to the manurial aspects of the question, some practical solution of the difficulty will soon be forthcoming. We may add that the question of manuring will relate principally to irrigated cotton, *i.e.*, the long staple cottons.

Improved Varieties and Seed Farms.—With regard to the evolution or isolation of superior varieties, the Committee lays stress on the improvement of the indigenous varieties and of the Foreign varieties which have become acclimatised. The Egyptian cotton proposed for Sind is an exception; the introduction of any further exotics is deprecated. Botanical surveys, trial of varieties, selection and crossing are all dealt with, and the problems of each Province

considered separately and recommendations regarding the most promising lines of work to be adopted in each of the provinces indicated.

The question of seed farms and of the organization necessary for the supply of pure seed is discussed in full and the staff for working these organizations as well as for the improvement of the varieties themselves are specified. This is indeed a very important matter and it will be no small achievement if things can be so managed that one particular variety, whatever it may be, is grown pure and unmixed throughout any one particular tract. Even with the ordinary varieties this will be greatly appreciated by the trade, while with the better or improved varieties the effect will be marvellous. The Departments of Agriculture as well as private agencies and Co-operative Societies, Cotton Growers' Associations and allied bodies will have to work together to secure this end and the necessary staff indicated by the Committee will also have to be provided.

Mysore Cotton.—The recommendations in this section are given province by province and Mysore though only of very minor importance as a cotton tract is not left out. The Chitaldrug cotton and Cambodia are referred to, but the cotton of the Mysore District finds no mention. The extension of Cambodia cotton under irrigation is recommended; and as regards dry land cotton the work of the Bombay Department is to be closely followed, as whatever applies to the Kumpta cotton of Southern Bombay will apply to the Chitaldrug *sannahatti*. Cambodia cotton is, as readers are aware, being popularised and the work of trial and improvement of the local cotton is already in progress.

II. COMMERCIAL.

Better Price for a Better Cotton.—On the commercial side, the Committee's recommendations are elaborate, and the principal ones such as will necessitate legislation. The most important and at the same time the least complex of these, we take it, is the means to be adopted to ensure to the

cultivator a better price for a better cotton. It is obvious, that in the absence of such an inducement no measures will avail anything; as the Committee remarks in conclusion, "it will rest with the Cotton trade to convince the cultivator in the only way in which he can be convinced that long staple cotton pays him better than any other varieties."

We have no doubt that when long staple or other superior cotton comes into the market in really large quantities there will be buyers willing to pay a better price for it. It is in the initial stages when the various Agricultural Departments introduce the cultivation of superior varieties that the chief difficulty arises; and it is at this stage that the sympathetic co-operation of the trade is quite essential. In general, the trade cannot guarantee a better price unless large shipments are forthcoming, and the large area required for this purpose cannot be put down unless a good price is assured. This vicious circle cannot be broken unless the trade views matters with far sighted sympathy. The Committee's recommendations are most valuable in this regard. New varieties have to be properly tested, not merely in the Experimental Farm scale but in the ordinary ryots' way; the trade has to approve and set its seal of sanction upon the new variety; auction sales are to be conducted of the new cotton by the Departments of Agriculture, until such time as the variety becomes established both with the grower and the buyer. Even in the sale of ordinary varieties, the Committee makes important recommendations calculated to secure for the cultivator a better price for his cotton.

Prevention of Fraud.—The other important subject dealt with in this section is the prevention of adulteration, damping, lack of cleanliness in the cotton and other defects of Indian cotton. The Committee exonerates the cultivator from blame as they are venal and often unavoidable. It is the ginneries and presses that are the greatest offenders and the Committee is justly severe on them both in its condemnation and in the preventive measures proposed. "Cotton waste is imported by wagon loads from Bombay for being mixed up with cotton. Cotton damaged by rain is mixed with good cotton. Cotton is deliberately watered. Cottons of different varieties are mixed, short staple or inferior cotton being often imported

from places hundreds of miles away to be mixed with higher priced cotton. Ginning machinery is so adjusted that crushed seed passes into the ginned cotton; seed or unginned cotton is placed inside ginned cotton; the kappa is not always passed through an opener and even when it is, fans are often stopped purposely to allow the dust beaten out to fly back into the cotton"—a truly formidable arraignment. The Committee is opposed to a *laissez faire* policy in this matter and proposes drastic action. In the main, these relate to the licensing of presses and ginneries and to the restriction of the transport of waste and of cotton except under scrutiny. The conditions of licensing are pretty strict; we refer readers to the report itself for details.

Organization, Staff and Cost.—The Committee has also recommended the formation of two organizations, one under Royal Charter, to be called the East Indian Cotton Association on the model of the Liverpool Cotton Association and another a Central Cotton Committee. The first would be Central Commercial Body which would keep the Indian cotton trade in responsible touch with cotton trades and associations abroad. The second will be more in touch with the business of cotton growing, advising Government on matters of policy, making recommendations regarding the development of long staple or other cotton in particular areas, dealing with the licensing of gins, with cotton statistics, advising about the merits of new varieties of cotton and so on. This latter Committee will also have a cotton technologist on its staff.

The Committee contemplate the expansion of the different Departments of Agriculture, the appointment of more Deputy and Assistant Directors, Entomologists, and so on; the cost of these as well as that of the Central Committee proposed is estimated at sixteen lakhs of rupees which it is proposed to meet by a cess of eight annas a bale on all cotton used in the mills in India or exported.

We have been able to do little more than draw attention to some of the salient points of the Report in this brief review. The report is so thorough and so full of up-to-date information with every aspect of the cotton industry throughout India, that we would commend it as a book of reference to all interested in the subject.

MYSORE ECONOMICS.—II

AGRICULTURE; INCREASE IN TOTAL OUT-PUT.

BY K. SUBBA RAO, B.A.

THE immediate and urgent need of the country would seem to be a mighty and sustained effort to increase the total out-put of crops. In spite of the inscrutable decrees of Heaven, victimising millions of people in wars and epidemics in the past few years, the daily wants of these yet left behind in the land of the living are growing imperative. At the rate at which food-crops are now selling, it must be exceedingly difficult for large sections of the population to provide themselves with food grains enough for full sustenance. Increased out-turn continually for a number of years is the only remedy for the high prices at present prevailing and the almost depleted stock of food grains. The larger the quantity of food grains we grow, proportionately more will be available for local consumption and more for export outside.

The next point for consideration is what are the main factors to be kept in view, for increasing the total agricultural out-put of the State. They are in brief two.

The first is to increase if possible the out-turn from lands under cultivation by the adoption of improved methods, improved appliances and the application to the land of more manure. The agricultural department is publishing the results of its experiments and advising ryots on the proper methods to be adapted in a variety of ways, *e. g.*, ploughing the land in time and more effectively, the selection of seeds, the kind and quantity of manure to be applied, transplantation, the particular kinds of implements suitable for the particular crops, how to guard against crop pests, etc. What is wanted is that by sympathetic and incessant supervision the ryots should be persuaded and aided to bring into practical use the

advice tendered in the publications of the Department. This is being done now, but may have to be done on a larger scale.

In talking of increased out-turn, it must be understood that human skill can aid us to some extent only and a great deal depends on the adequacy of rainfall in suitable seasons.

This is one of the mightiest factors which defy all human calculations. This is an eternal equation and while bearing it in mind, the other factors which lie within the effort of man need not be neglected. While on this subject it may be relevant to refer to the high prices that dry crops now command and the increased profits which dry crops are bound to yield.

The tapping of the underground water-supply deserves more systematic attention than that hitherto bestowed upon it. In some of the more advanced and progressive parts of the world, wells are dug 300 to 400 feet deep and the water is pumped out from the very bowels of the earth. In Mysore Geological investigations would appear to bear out the advisability of sinking deep wells.

The deeper the wells, the more assured is the water-supply. A department purely for sinking wells in suitable localities to increase the supply of water for drinking purposes and for irrigation is an urgent want and has to be supplied without loss of time. Our ryots and the general public are keenly alive to the great advantages of sinking wells and increasing their number. But it is not within their means to spend money on experiments and they cannot command the necessary technical skill and costly instruments. If the Government would undertake the purely experimental portion of the work and the supply of the necessary implements and skill, the people would gladly bear the entire cost of construction. The Government are exceedingly solicitous of the welfare of the ryot population and of prosperous seasons. The *Taccavi* loans go some way. The more

direct help in sinking wells will be an effective auxiliary to the *Taccavi* loans, and if by the sinking of deep wells on a larger scale, the underground water-supply can be utilised, increased out-turn in several food crops and vegetables and fruits can be relied upon to a larger extent than at present.

A question may arise as to whether all the lands under occupation are cultivated. A portion is not. Land requires rest and a portion may be left fallow. If this were the only consideration and criterion, then such portions of the occupied land as are not cultivated but are held as a reserve, in the long run help the total output. But I am afraid there are instances of lands occupied, not being cultivated because the owners could not command the necessary agricultural labour and capital. Notions of family or personal dignity, attachment to estates acquired by ancestors, hope of better days and such considerations have stood in the way of men selling the portions of land which they are not able to cultivate. They pay the *Kandayam* but do not reap any benefit. Such cases deserve to be investigated. Even in the most enlightened countries, lands are held as all other property, for the best use that could be made of it. With increasing difficulty for food grains, it is not unrighteous to hold that every one who holds cultivable land fit for the plough, should use it for the best advantage of himself and the public, instead of allowing it to lie idle year after year, merely because he pays the Government assessment. More important than the *Kandayam* to Government is an adequate food supply for the people. It would be well if the Revenue Department and the Agricultural Department will keep this prominently in view and investigate into such cases and by acts of persuasion and assistance, enable ryots to make the best use of their entire holdings in tracts in which there is laxity in this respect. It is here that Taluk Progress Committees and the District Committees and Co-operative

Agricultural Societies can play a very useful part. It is only the spread of sound economic ideas and co-operation and help that can eradicate this evil. Ryots' associations, if they could be formed, would be most useful agencies. Every owner of arable land, poor or rich, must be made to understand that every bit of land fit for raising agricultural produce which is left waste, means so much loss to the country by a diminution of the total output.

The second factor is the vast extent of assessed waste lands available for cultivation, i.e., lands which the Survey Department have thought fit to assess but which the people have not taken up. It may be that a good deal of it is mere *Kharab*. But there is no doubt that in this vast extent there are lands which can be made fully remunerative. Some conception of its vastness may be formed from the fact that it is nearly a million acres. Portions of it must be suitable for dry cultivation, for fodder crops, for rearing sheep and cattle. There are also *Amritmahal Kavals* to be released for cultivation, and those already released. Similarly the date reserves contain in the popular imagination lands which can be, without loss to the Excise Department, thrown open for cultivation. These sources at present furnish a large area of land which may be newly brought under cultivation and which may be therefore usefully employed in increasing the agricultural out-put. But what stands in the way is the want of agricultural labour and capital, also difficulties of transport and locomotion in the Malnad. Some years ago an European traveller well versed in continental methods of agriculture and sericulture, travelling with me in the Kadir District, was struck with inexpressible wonder at the paucity of population and the stretch of beautiful expanse of land awaiting the hand of the labourer for giving plenty of useful crops. Mysore has thus immense potentialities for increasing food supply and it must be the devout prayer of all well-wishers of the State that immediate steps should be more actively pursued with the single aim of bringing about this great end. Land, climate, scenery, the monsoons in spite of their vagaries and inconsistency, are all in our favour. Capital, appliances, labour, supervision, sympathetic and systematic guidance, are urgently needed. To some of these I shall refer later on.

CO-OPERATION IN THE UNITED PROVINCES, 1917-18.

BY "RUSTICUS."

THE Report of the Registrar of Co-operative Societies in the United Provinces on the working of his Department in 1917-18, is anything but cheerful reading. Figures are not, in themselves, an altogether satisfactory criterion of progress or the reverse especially in the case of the co-operative movement where, in recent years, consolidation has been far more important than expansion. None the less, where they reveal a distinct drop for the first time, they show that things are not as they should be. The number of societies in the United Provinces fell, in 1917-18, from 3,245 to 3,090, the number of members from 114,165 to 101,626, and the working capital from about Rs. 120½ lakhs to Rs. 111½ lakhs. The drop in working capital is especially regrettable for, as is pointed out in the Local Government's review of the Report, the cultivator now needs more capital for his ordinary requirements than he used to do when prices were lower and the value of money was correspondingly higher. The amount due to central banks at the close of the year was Rs. 39'40 lakhs, of which Rs. 20'15 lakhs or 51'1 per cent were over-due against 4'12 per cent at the end of the previous year. Primary Societies were in even worse plight. The total arrears in their case amounted to 64.2 per cent of the out-standings, the highest figure recorded in any of the Reports we have so far reviewed.

It is evident that by no means the larger share of the blame for this unsatisfactory state of affairs can be laid at the door of the unfavourable agricultural season though that was undoubtedly a contributing cause. The Registrar, Mr. Makbul Hosain, has some outspoken comments on the situation as it

appears to him. Bad societies founded in the early days of the movement when, in the United Provinces, as elsewhere, enthusiasm much too frequently outran discretion, are being gradually extinguished. But this, in his opinion, is not sufficient, and, even in their case, something might have been saved from the wreck if there had been more supervision and sympathetic control. Mr. Makbul Hosain pleads for greater effort on the part of Government and the non-official public alike. The harvest would be plentiful, but there are far too few labourers in the vineyard. The Government staff is small and almost all its time is taken up by audit. The number of non-official workers is, in itself, not inconsiderable but very many more are required. The plea for additional staff for propaganda work is met sympathetically by the Local Government which promises to appoint more inspectors shortly and hints that the post of Joint Registrar will be made permanent. On the question of stimulating the interest of the educated public and enlisting its services in furthering the progress of the movement, it offers no comments.

Of the 3,245 societies in existence in the United Provinces, 3,008 are agricultural primary societies and it is, therefore, on the successful working of these that the stability of the movement depends. This being the case, we may be pardoned if we give a few of the figures which relate specially to them. Compared with the previous year, the advances were lower by Rs. 6.48 lakhs, the collections smaller by Rs. 5.48 lakhs in principal and nearly a lakh in interest and the arrears, including postponements, larger by over Rs. 3 lakhs. The only satisfactory feature was that the proportion of the share capital and the reserve fund to the total out-standings increased from 37.6 to 46.5 per cent. For the depression into which the primary societies have fallen, Mr. Makbul Hosain holds the central banks responsible in that they have not sufficiently supervised their primary societies. It is not a matter

of one year or even two but of several. The longer arrears are allowed to accumulate, the more difficult becomes their recovery. Another factor which has contributed but for which the central banks are in no way to blame is the slowness of liquidation and arbitration proceedings. At the end of the year, there were no less than 345 liquidation proceedings pending. Sixty-four only were completed during the year and, at this rate, it will take about $5\frac{1}{2}$ years to deal with the remainder. It is obvious that, where liquidation proceedings are disposed of at this pace, liquidation can only be used in the very last extremity and the fear of it is not a very powerful deterrent to bad societies. However, a great improvement in this respect is in sight for the Local Government have decided to introduce a bill into the Legislative Council, the effect of which will be very considerably to shorten the proceedings.

As for central societies, the Registrar considers that very few of the smaller central banks served their purpose satisfactorily. Six of them had to be closed. The main obstacle to their successful working is the attitude of the paid managers who are given far too free a hand by the Directors and resent any interference from the District Banks to which they are affiliated or even from the Registrar and his staff. The only remedy is a Directorate which is capable of taking a more active and intelligent interest in the working of the institutions at present only nominally in its charge—in other words, education and yet more education. Various alternatives to the smaller central banks have been tried but none of them appears at all promising. One guaranteeing Union has worked well in Bijnor but the guaranteeing Union is no more popular in the United Provinces than it is in Bengal or Bihar and Orissa as societies are unwilling to shoulder any risk but their own. In these cases, branches of District Banks have been opened, the branch being in charge of a supervisor or an assistant manager under the control of a Director.

The chief business of these branches is the receipt and custody of money and the early disposal of loan applications, a limit being fixed to the amount they may grant on loan. This system can only prove successful if the Director of the District Bank takes a close interest in the societies to whose need the branch under his control ministers and this at present is not the case. The third system, that of a supervising and organizing committee under the District Officer or Sub-Divisional Officer was only tried in one place where it broke down owing to the transfer of the Sub-Divisional Officer. It hardly seems worth while pursuing it if its success depends so entirely on the interest displayed by an individual officer.

We notice, with regret, that the Registrar, against his better judgment, allowed some of the larger banks to make use of a part of their overdue interest in distributing profits to their preference shareholders. Mr. Makbul Hosain admits that this is unsound finance and that the only argument which has been adduced in its favour which is that, unless there is some distribution of profits, the shareholders and the public will take fright, has no cogency, the true remedy being to get in the overdue interest without further delay. He expresses a hope that no further applications of this kind will be made to him. They certainly will not be if he announces at once that, in no circumstances, will they be entertained. He states that the dividend allowed was at a much lower rate than had been distributed in previous years. The amount of the dividend does not affect the question of principle and it is to be hoped that Mr. Makbul Hosain will steel his heart in future and will not permit any misplaced sympathy for the troubles of banks, which have only themselves to blame, to induce him to sanction a thoroughly unsound procedure.

Of the non-agricultural credit societies in the United Provinces two blanket weavers' societies, a few weavers' societies and a

bangle maker's society were the only exceptions from the general stagnation. Agricultural societies for purposes other than credit fared very little better. Four ghee societies are doing fairly well but their operations are on too small a scale at present to enable any definite opinion to be formed as to their eventual success. The Allahabad Dairy is reputed to be flourishing, mainly because of the interest taken in it by Mr. Fremantle, a former Registrar. Here again the operations are on a very small scale as the value of the milk supplied by the members who number 49 was less than Rs. 6,000. The cattle insurance societies in the United Provinces are only four in number and are not prospering. The main difficulties, as described by the Registrar, are the frequent changes made by the members in their cattle, their unwillingness to deprive the village leather workers of their customary right to appropriate the carcass in return for a pair of shoes or a leather bucket and, above all, their lack of comprehension of the working of their societies and of faith in them. In these circumstances, it is hardly surprising that Mr. Makbul Hosain does not anticipate any early results. A few of the distribution stores did well, the most successful being the Sandila Yarn Store, which increased the value of its sales to over a lakh of rupees and made a profit of Rs. 8,155.

There is only one Co-operative Society in the United Provinces for the purchase and sale of agricultural produce and that worked at a loss. A large number of central banks, however, furthered the cause of agricultural development by spreading the cultivation of Pusa wheat, Mauritius sugar-cane, Jaunpur maize and Aligarh cotton. The experiments in the co-operative use of machinery deserved a better fate. Oil engine water lifts were established in three places, but, owing to war conditions, when anything went wrong, spare parts were not available and the rise in the price of oil made economical working difficult. This was unfortunate as there are large tracts in the United Provinces in which there are great possibilities for tube wells and oil engines. We have, however, little doubt that neither the Agricultural nor the Co-operative Department will be deterred from trying again.

METHODS AND MACHINERY FOR THE EXTRACTION OF OIL FROM SEEDS, ETC.*

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OWING to the number of enquiries received recently for methods and types of machinery for the extraction or expression of oils from seeds, it is considered desirable to supply as much information as possible on this subject.

This article deals entirely with methods of extraction of what are known as fixed vegetable oils or fats, which are all derived from seeds of various kinds and does not treat of what are known as essential or volatile oils which are usually obtained by distillation, enfleurage or extraction by solvents from the flowers, leaves, stems or roots and occasionally seeds of plants. The fixed oils or fats are so-called, because they are not usually volatile in steam and cannot therefore be obtained by a steam distillation process. They are used for a variety of purposes, chief among which are their use for edible purposes, principally as a substitute for butter fat, for the manufacture of soaps and candles, for lubrication purposes in machinery of all kinds, and for the manufacture of paints and varnishes. The volatile or essential oils are used directly or indirectly as the basis of all scents, flavouring matters, essences, etc.

The chief representatives of vegetable edible fats are coconut oil and palm kernel oil, although cotton seed oil is also used extensively as is ground-nut or earth-nut oil.

Other vegetable oils are used to a lesser extent for adulteration purposes. Olive oil is also used largely as a salad oil and cotton

*With acknowledgments to the *Agricultural Bulletin of the Federated Malay States* for January and February, 1919.

seed oil is also used for the same purpose. First quality cold expressed castor oil is also used medicinally. Many fats and oils are used for soap and candle-making, in fact most of those from which the solid fatty acids are obtained in quantity and which cannot be used for various reasons for edible purposes. Castor oil, particularly the darker coloured oil, is used extensively for lubricating purposes, especially in tropical countries for heavy machinery—locomotives, etc. It is generally too viscous for similar use in cold and temperate climates. The development of the aeroplane industry, due to the present war, has increased enormously the demand for this oil, especially for a certain type of aeroplane engine. If this development is continued for commercial purposes the demand for castor oil is likely to be maintained.

The principal vegetable oil used for paint and varnish making is linseed oil the value of which lies in the fact that it can absorb oxygen from the air and forms by so doing a varnish-like film, being classed on this account as a drying oil. As is now generally known, rubber seed oil is also in this class although not as efficient a drying oil as linseed.

Practically all seeds contain more or less oil or fat but only seeds containing a comparatively large percentage are of value commercially as oil seeds.

A number of seeds from wild or forest plants and trees also contain valuable oils, e.g., the tree which yields Borneo tallow, Shea Butter, Tenkawang and Illipé fat (*Shorea* sp., *Hopea*, etc., vide *Agricultural Bulletin*, Vol. I, No. 4 of November, 1913,) which however are not of great commercial value owing to the irregularity in fruiting. It is possible that some of those in our Malayan forests might be worth cultivation as a source of oil, e.g., *Carapa Moluccana* and *Kapayang* (*Hodgsonia heteroclita*?).

The fixed oil or fat is extracted from seeds by one of two methods (a) expression (b) extraction with solvents.

Since it is not intended to discuss in detail the latter process, it will be briefly described first.

EXTRACTION PROCESS BY THE AID OF VOLATILE SOLVENTS.

In the extraction of oil or fat from seeds by means of volatile solvents, the seed is crushed to a fine meal and placed in special extraction apparatus connected to the vessel containing the solvent. The solvent is boiled and made to distil into the vessel containing the seed meal. After the solvent has permeated the meal and dissolved a portion of the oil or fat, on reaching a level just above that of the surface of the meal, it is automatically syphoned back into the vessel containing the solvent. The process of boiling the solvent and causing it to distil and condense in the vessel containing the meal and then to syphon back into the vessel containing the solvent is continued until the solvent has extracted all the oil or fat from the meal.

The number of extractions required and the time taken depend chiefly on the character of the seed and the fineness of the meal into which the seed is ground. By tapping off the solvent from the meal container at intervals, tests can quickly be made to ascertain whether the oil or fat has been extracted thoroughly.

The solvent containing the oil or fat is then distilled off, leaving the pure fat or oil behind and the solvent can be used again for further extraction purposes.

The last traces of solvent are very difficult to remove from the oil or fat, which has to be purified by blowing air or some inert gas, e.g., carbon dioxide, through the heated fat.

It is said that the extraction process for separating oil or fat from seeds is becoming employed more extensively during recent

years and that for many purposes the extraction method has advantages over the expression process.

Its value compared with the expression process depends on the fact that practically all the oil or fat can be removed from the seed, whereas by the highest hydraulic pressure, usually about 6 to 8 per cent of oil is left in the oil cake or residual meal, representing a loss of about 3 to 4 per cent on the original seed or 6 to 8 per cent of the total oil content in the case of a seed containing say 50 per cent of oil or fat.

Although the yield of oil is higher by the extraction process, the residual cake is of less value for cattle feeding, etc., since it contains little or no oil.

Further, seed which has been extracted by means of solvents is often not of any use for feeding purposes, owing to its non-palatability, due to traces of the solvent, which are difficult to remove. Such cake is very suitable for fertilizing purposes, but its monetary value is less for such a purpose than as a cattle-food.

In other respects, the comparative value of the extraction and expression processes depends largely on the loss of the volatile solvent in the former. With efficient condensation and distillation apparatus, the amount of solvent lost is small.

The solvents largely employed are carbon bisulphide, carbon tetrachloride and trichlorethylene. Any very volatile solvent of oils or fats may be used, and the liquid employed depends largely on cost.

Owing to the relatively high temperature in this country, it is probable that an extraction process would not compare favourably with an expression process, on account of unavoidable losses of solvent due to the difficulty of efficient condensation in the recovery of the solvent.

In some cases, *e.g.*, in the preparation of castor oil, both the extraction and expression processes are combined, the latter being

employed first in order to obtain a high class medicinal oil by cold pressing of the seed, followed by chemical extraction to remove the remaining oil. This combination, however, is not carried out in all factories in which castor oil is manufactured.

PROCESS OF PREPARATION OF OIL FROM SEEDS BY EXPRESSION.

The expression process for the extraction of oils from seeds is very ancient; the wedge press and the large wooden pestle and mortar in which the pestle is rotated usually by bullock-power are well-known in the East.

These crude processes, however, are not efficient or economical, owing to the comparatively low pressure which is obtained and can only be used where labour is cheap. The ordinary bullock-driven pestle and mortar press leaves about 15 per cent or more oil in the residual cake compared to about 6 per cent in the most efficient modern hydraulic presses.

In modern oil-pressing factories the pressing system has resolved itself into two—the Plate (Anglo-American) system and the Cage system. The expeller system, as represented by the Anderson oil expeller, is a more recent development and will be discussed later.

In the case of both systems, the preliminary treatment of the oil-bearing material is similar, apart from different treatment in respect of decorticating or removal of shells or husks, which must vary of necessity with different types of seed.

It is not intended here to discuss the special methods which have to be employed to remove the shell from such different seeds as say the coconut, palm nut, castor seed, etc., since this would necessitate a description of details of many special machines, but to describe only such machines as are employed generally after the seed has been decorticated, or before, in such cases where the whole seed may be treated.

In the case of seed from a plantation, *e.g.*, castor seed, para rubber seed, coconuts, etc., preliminary screening to remove impurities,

is not usually required. By decorticating, however, twice the amount of seed can be treated in a given time compared with undecorticated, in the case of a seed containing 50 per cent of shell or husk, since the shell or husk rarely contains oil.

Disintegrators.—The first operation, which can be dispensed with in many cases, is to break up the seed into small pieces or into a coarse meal, which is carried out in a machine known as a disintegrator. A number of different types of machines are used, but a common type consists of revolving grooved discs between which the seed is drawn and broken up by the discs, one of which may be stationary or both moving in opposite directions. Another type consists of rollers with blunt knives. Copra is a well-known example of a seed which requires treatment in a disintegrator in order to break it down into small pieces before passing to the crushing rolls.

Crushing rolls.—The next operation, after disintegrating, is to pass the coarse meal or small seeds, whole or decorticated, through crushing rolls where the seed is ground or pulverised to a fine meal. This operation is of importance since the fineness of the meal and the breaking up of the oil cells has an important effect on the efficiency of the subsequent expression of the oil. The seed must also be of a suitable dryness before passing between the rolls of the machine, otherwise "spueing" takes place and clogging. The machine consists usually of a set of five superimposed rolls, the top roll being corrugated or grooved horizontally. A small horizontally-grooved feeding roller is also attached to feed the meal on to this top roll. A hopper is attached to the top of the machine to receive the meal. In all large factories the disintegrated seed is fed on to the crushing rolls by means of a conveyor or chute, and the crushed meal from the bottom roll falls into a pit or chamber from which it is again removed by means of suitable conveyors to the steam kettle.

(NOTE.—In the case of cold pressing of seed, e.g., of castor seed, in order to obtain the highest quality medicinal oil, the seed is not crushed but taken whole to a "Cage" press. The residual meal from the once cold pressed seed is, however, after removal from the presses, passed through crushing rolls.)

Steam kettle.—The next process, unless a cold pressed or cold drawn oil is required, is to convey the crushed meal to a "steam-kettle" which consists of a large open cylindrical steam-jacketed pan, provided with a damping arrangement by means of which steam can also be passed direct into the meal in the kettle in order to moisten it sufficiently. The kettle is also provided with a stirring arrangement to keep the meal thoroughly mixed. Crushed meal is continuously being fed into the kettle from the crushing rolls and removed for the presses. The temperature to which the crushed meal is raised in the steam kettle depends on the seed and the nature of its oil content. Usually, however, the temperature is in the neighbourhood of 139° to 140° Fah. The heating or "tempering" of the crushed meal is obviously to render the oil content of the seed more readily extractable, by increasing the fluidity of the oil and by breaking up the oil cells in the seed and also by coagulating some of the protein or albuminous matter, which would otherwise pass into the expressed oil.

Cake moulder or forming machine.—In the case of the open plate or Anglo-American presses, the heated meal from the steam kettle has next to be passed to a cake moulding machine in which it undergoes a preliminary pressing, sufficient to compress the meal into a cake or compressed mass which can be handled, but not sufficient to remove any oil. A box open at the top and bottom, which holds sufficient meal to form one cake, is placed beneath an opening in the steam kettle, which is closed by means of a small door. This box rests on a slide which forms the bottom and which runs from the steam kettle to the cake moulding machine, which

is always placed next the kettle. Beneath a rectangular opening in this slide attached to the cake moulding machine is placed a steel tray covered with the cloth in which the cakes are contained for pressing. The cloth is more than twice the length of the cake so that it can be wrapped round the meal longitudinally leaving only the long sides of the cake open.

The open box of meal is pushed by hand until it reaches the opening in the slide above the tray, into which the contents are dropped.

The cloth which overhangs the tray at each end is wrapped or lapped over the rectangular shape of meal and the tray holding the meal is slid on to the table on the ram of the cake moulding machine, actuating a lever which allows steam to force up the ram automatically and presses the cake against the top of the cake moulding machine.

The lever is then actuated by hand and the ram drops, allowing the operator to remove the tray and compressed meal which is then taken to the open plate press. The compressed cake is placed on a plate in the press, and the tray removed by sliding it from under the cake. The operation of producing cakes in the cake moulding machine is repeated until the press, which usually holds 16 to 18 cakes, is filled, when the press is raised as described below. In order to render the operation continuous, one cake-moulding machine usually supplies four presses, so that while one press is under pressure, the others can be filled and emptied.

NOTE.—In the case of the Cage press the cake moulding machine can be dispensed with, since the meal is enclosed in a cylindrical cage, and formed into cake in the press itself.

Anglo-American Presses.—The Anglo-American or plate press consists of a series of superimposed strong steel plates separated from each other by suitable means and

resting on a powerful ram. The ram is raised by means of hydraulic oil pumps and accumulators and the plates between which the cakes of meal are placed, are raised and pressed against the top of the press. The cakes are thus pressed and the oil commences to flow at first slowly and subsequently more rapidly from the sides of the plate and is caught in a tray beneath the press plates and from thence can be led into a suitable chamber or pit beneath the press.

The press is slowly raised to the maximum pressure, which in the most powerful presses rises to 2—3 tons per square inch, and left at this pressure for a period of 5 to 15 minutes, until the oil ceases to flow. The pressure is then removed and the ram drops, enabling the cakes to be removed by hand.

As the expressed cakes are removed, fresh cakes are placed in the press till again filled and the operation repeated. By means of suitable distribution valves, each press in a battery can be placed under pressure and released independently, enabling the operation to be continuous. Pressure on the ram is obtained from hydraulic oil pumps worked by means of an engine or motor.

It should be stated here that the press plates are corrugated or grooved on each side in order to allow the oil to flow away more readily. They are also concave on each side in order to prevent the meal from being squeezed out, except in small quantities. This corrugation of the plates gives the well-known corrugated appearance to all oil cakes. In the Anglo-American or plate presses the edges of the cake always retain a fair proportion of oil, owing to spueing of the cake at the edges of the plates. The cakes are therefore removed to a cake-paring machine, in which the edges are pared off and the parings again passed through the crushing rolls and the steam kettle.

The pared cakes can then be stacked in suitable racks to enable them to cool down before storage.

All seeds requiring a single pressing are usually treated in these presses. Many seeds require twice pressing, especially those in which the first pressing, for special reasons, is carried out on cold pressed meal.

Copra and other seeds containing a high percentage of oil are almost invariably pressed twice, both pressings being on heated meal.

Cage Presses.—In some oil mills, cage presses are used exclusively. As stated above, in the case of the cage press, which is an enclosed press, the cake moulding press can be dispensed with, since the cakes are made direct by pressure in the press. These presses are often built under the steam kettle. The ram is raised nearly to the top of the press and a definite amount of heated meal from the steam kettle regulated by a chamber beneath is dropped on to a press plate on top of the ram, the press plate being covered with a mat or cloth. Another cloth and press plate is then dropped on to the meal and a further cloth and then more meal, so that each lot of meal is placed between two press cloths and two steel plates. The ram is slowly lowered at a rate corresponding with the rate of feeding in the meal.

When the press has been filled in this manner a massive slide is moved over the top of the press and the ram is raised. The oil is squeezed out through the sides of the press, which consists of a perforated cylinder or more usually a series of stout steel bars, while the cake is retained. In order to prevent squirting of the oil, these presses are usually surrounded with a thin galvanized cylindrical sheet of metal. The oil flows into a tray beneath the press.

It is generally intended that the cakes from these presses should be again reduced to meal and repressed in other cage presses or in an Anglo-American press.

It is, I believe, the general opinion that the Anglo-American presses can be subjected

to a considerably higher pressure than the cage presses since the pressure capacity of the latter depends on the strength of the steel bar cylinder or cage. In this country, however, we have mills for the manufacture of coconut oil from copra working entirely with Anglo-American presses and others with cage presses only. One mill, with only Anglo-American presses carries out only one hot expression while another with cage presses carries out two hot pressings.

One manufacturer of oil machinery also states that the Anglo-American or open plate presses are not satisfactory for seeds yielding more than 35 per cent of oil at first pressing. This, however, is not borne out by practice.

It may be stated here, that the advantage of a second pressing, where the first has been fairly efficient, depends largely on the capacity of the mill and the price of oil. If the capacity of the mill is small and the price of oil high, it would be more profitable to carry out only one pressing.

Usually the cage press is of a circular type and produces a round oil cake but square presses are now made.

In some cage presses, used for the manufacture of castor seed oil, in which whole seed is fed into the steam kettle and raised to a temperature of only 90° Fah. (this is obviously in a temperate climate) with a first cold pressing and with a pressure of three tons per square inch on the ram, the amount of oil left in the cake has amounted to less than 10 per cent. Four of such presses can be operated by two men, each press having a capacity of 5 cwts. of seed per pressing or a total of two tons per hour for the four presses with two pressings, or three tons with three pressings per hour. The ordinary rate of working is from four to six presses per hour.

One advantage of the cage press is the saving in the expensive press cloths or mats, which probably amounts to over 50 per cent compared to the plate or Anglo-American press.

One oil machinery firm gives the following list of seeds as suitable for pressing in Anglo-American presses—linseed, cotton, soya beans, ravigon rape, mustard, sunflower and similar seeds. This firm states that the Anglo-American system is adopted in all modern mills for the above seeds and gives the best results in respect to economy of labour and maximum oil expression.

The following seeds—palm kernel, copra, castor, gingelly, ground-nuts, poppy and East Indian rape seed or seeds which require twice pressing are said to be more suitable for treatment in cage presses for a first pressing, followed by the Anglo-American press for second pressing.

Cake-paring machine.—A cake-paring machine is required only with the Anglo-American or open plate hydraulic press, in order to cut or pare away the edges of the cakes which contain a fair proportion of oil. It is not necessary here to describe this machine in detail.

Hydraulic pumps and accumulators.—To supply the necessary pressure to the hydraulic presses whether of the Anglo-American or cage type, hydraulic oil pumps driven by a motor or engine are required. In the case of large installations accumulators are recommended by oil machinery manufacturers, as giving a more steady even pressure, and being less liable to give an undue excess of pressure through the locking of safety valves common to hydraulic pumps. The accumulators act as safety valves to the hydraulic pumps which supply the necessary pressure.

Press cloths.—Press cloths are essential in the Anglo-American or open plate press for enclosing the cake. These cloths are very expensive and require renewal fairly frequently owing to bursting by the pressure in the hydraulic presses. They are usually made of camel hair and apparently few suitable and more economical substitutes have been found. In the cage press, they are usually employed between the plates, but

can be dispensed with. In any case they lie flat on the press plates and are therefore not subjected to any pressure at the edges as in the open presses where they are folded round the cake.

Filter presses.—In order to avoid the use of large settling or subsidence tanks, all modern oil mills are equipped with filter presses, in order to filter and clarify the oil from "foots" almost immediately after the oil is pressed from the seed and thus render it suitable immediately for marketing. Storage tanks are then required only for the filtered oil. The "foots" can be returned quickly to the steam kettle and presses to remove any oil retained. Special filtering cloths are required in these filters, which work under pressure.

One oil machinery firm states that a filter with 45 plates, each 32 inches square will filter about 150 tons of crude oil, before it is necessary to remove the filter clothes. These cloths can then be removed, cleaned and used again several times. The oil is forced through the filter by means of special pumps.

Fats which are solid at ordinary temperature obviously require heating to render them fluid before filtration.

Oil pumps.—Rotary or other type of suitable pumps are required to pump the oil from chambers or pits beneath the hydraulic presses or filter presses to suitable storage tanks.

Conveyors.—In order to minimise the amount of handling, special conveyors consisting of worm shafts, bucket conveyors and chutes are necessary for conveying the seed from the disintegrators to the crushing rolls and thence to the steam kettle.

Engine or Motor.—A suitable engine or motor is required to drive the disintegrators, crushing rolls, hydraulic pumps and stirring gear in the steam kettle.

Boiler.—A suitable vertical boiler is required to supply the necessary steam to the steam kettle and for actuating the ram in the cake-moulding machine.

Transport of oil to markets.—Hitherto most oils manufactured in the tropics have been transported in tins, barrels or other containers. Formerly, all the coconut oil manufactured locally was shipped in the well-known kerosene tins packed in pairs in wooden boxes. These being now unobtainable in quantity, barrel packing has been adopted.

The writer, however, is of opinion that the most satisfactory method of export is by means of tank steamers, using either bilge tanks or steamers with specially constructed tanks for the purpose. It appears probable that this system will be adopted in the future. It is said to be already in the Philippines for the export of coconut oil to America. In the case of oils which solidify in a cold climate, e.g., coconut oil, it will be necessary to heat the tanks before arriving in port, in order to be able to pump the oil into receiving vessels. This, however, presents no special difficulties.

The above is a detailed outline of the machinery necessary for the manufacture of oil from all oil seeds by the hydraulic press system, which is at present almost the universal system throughout the world in modern factories. The names of well-known manufacturers of hydraulic oil-pressing machinery are given at the end of this article.

THE ANDERSON EXPELLER.

A comparatively new machine which differs from the hydraulic press system has been in use for some years in America, especially for the expression of cotton seed oil. This machine is known as the Anderson oil expeller and is manufactured only by the V. D. Anderson Co. of Cleveland, Ohio, U. S. A. A machine working under the auspices of the Agricultural Department in St. Vincent, W. Indies, has also given good results with cotton seed, expressed on behalf of small-holders by the Agricultural Department. Information published by the

Agricultural Department of St. Vincent led the writer to make enquiries concerning this machine and it was ascertained that during the last few years, a large number had been imported into the Philippines for expressing coconut oil from copra (*Vide* paper "Coconut Products in the Philippines" by Mr. W. S. Cookson in *The Agricultural Bulletin*, Vol. VI, No. 11, September and October, 1918.)

Further enquiries elicited the fact that an old machine was actually working in Singapore and the writer has twice visited the small factory run by Chinese, in which this machine was found expressing oil at different times from ground-nuts, gingelly and Illipé seeds.

Tests carried out by the writer on the residual cake from this machine also showed its efficiency in expression, although it was not possible to spend a sufficient time in the factory to ascertain its capacity and output.

Information, however, since received from the makers shows that the capacity of the machine is very satisfactory and from the information available it would appear to be very suitable for use in the tropics, more especially, for the softer variety of oil seeds, although it appears to be giving satisfactory results also with copra in the Philippines.

If worked according to its maximum economical capacity, however, the amount of coconut oil expressed from copra is somewhat less than that obtained in hydraulic presses. If worked to obtain the maximum amount of oil, the capacity or output is said to be rather low.

According to Mr. Cookson who visited the Philippines early in 1918 there are nearly 200 of these machines treating copra in the Philippines and the demand has been such that machines have fetched seven and eight times their actual cost from the makers.

According to information contained in a recent number of the *West Indian Agricultural News*, this machine is also working satisfactorily on castor seed in Mysore,

extracting as much as 44.3 per cent of oil from seed containing 47.2 per cent yielding a cake containing only 5.05 per cent of oil.

Description of machine.—The expeller consists essentially of a horizontal cylindrical press, with sides constructed of steel bars, similar to the cage press. Pressure, however, is obtained by means of a screw working against a cone-shaped opening at one end of the machine. The screw carries along the crushed meal which is pressed against the sides and end of the machine and the cake is ejected in irregular pieces from the end of the machine. The meal is fed in through a hopper and the machine works continuously and automatically. A tempering apparatus consisting of a steam-heated trough is attached if necessary for heating the meal to the necessary temperature—the meal passes along this trough continuously. This tempering apparatus is evidently efficient, since Illipé fat is solid at ordinary shade temperature in this country (85° Fah.)

The necessary accessories consist of a motor or engine to turn the screw and to drive crushing rolls. The expeller itself requires about 15 h. p.

It is stated that the seed need not be crushed as finely as for hydraulic presses. In the factory visited by the writer a set of small crushing rolls was in use, for grinding the seed. Filter presses, storage tanks, etc., are obviously required for the oil and also a boiler to provide steam for the tempering apparatus, unless a steam engine is used for motive purposes, and it would be advisable to have a press, in a large factory, to convert the irregular lumps of oil cake into a solid circular or square cake for purposes of export.

Since the expeller works automatically, very little labour is necessary and, provided the machine is in proper working order, very little expert supervision is required.

The following details of the cost of the machine with accessories, were obtained

from an annual report of the Department of Agriculture, St. Vincent.

Expeller with "foots" elevator and "tempering" apparatus	£500.0.0
Crude oil engine 30 h.p. ...	300.0.0
Huller to grind seed ...	26.0.0
Shafting, pulleys, conveyors, belting, etc. ...	60.0.0
Total ...	£886.0.0
Add 20 per cent freight ...	177.0.0
Cost of erection of machinery, buildings, oil tanks, etc. ...	500.0.0
Total ...	£1,563.0.0

The price of the machine, as quoted by the makers at the end of 1918 was as follows:—

Cost of Expeller plus tempering apparatus ...	\$3,525 gold.
Cost of Expeller Box packing, etc. ...	75 gold.
Cost of Expeller plus tempering appartus plus motor ...	\$4,150 gold.
Cost of Expeller Box packing, etc. ...	90 gold.

This machine should be capable of treating about $\frac{1}{2}$ ton of seed per hour. From the above information, the number of expellers required to treat any given quantity of seed can be ascertained, together with the necessary power required. It may be stated that large seed crushing rolls will probably require about 10-12 h. p.

The advantages of this machine are its automatic and continuous treatment of the meal, minimising handling, and its low initial cost.

HYDRAULIC OIL MACHINERY MANUFACTURERS.

Two of the best known oil machinery firms in England are the well-known and old-established firm of Messrs. Rose, Downs and Thompson of Hull and Messrs. Greenwood and Batley of Leeds. The former

firm was the originator of the Anglo-American press system in England.

A well-known American firm would appear to be the French Oil Machinery Co., Piqua, Ohio, U.S.A. No information is available as to oil machinery firms in France, except those referred to in a recent article on palm oil manufacture in the *Agricultural Bulletin*.

It is at the present time of little value to publish details of cost of machinery supplied by oil machinery manufacturers, since the present prices are, approximately, double those of normal times.

The following details, however, of estimated machinery requirements in the case of coconut oil mills may be of value and interest in this country.

Capacity 2 tons of copra per hour. (Approx.)=1.2 tons of oil per hour.

SCHEME (1).

1. Seed bin, capacity 30 tons copra.
2. Shaking distributor.
3. Two sets breaking rolls.
4. Four sets Anglo-rolls.
5. Two hydraulic compressor extractors with extraction gear for cakes.
6. Two steam kettles with strickling gear.
7. Eight hydraulic finishing cage presses.
8. Eleven perforated pressing boxes with press plates for above.
9. Two travelling carriages.
10. Two sets low and high pressure distribution boxes.
11. Eight sets patent automatic pressure distribution valves for finishing presses.
12. Two oil receiving and settling tanks.
13. Two sets oil collecting troughs.
14. Two drip tanks under presses.
15. Two rotary oil pumps.
16. One cake breaker.
17. Three sets hydraulic pressure pumps.
18. One exhaust oil tank and one pump suction tank.
19. One set of high and low pressure accumulators.
20. Three elevators.
21. One scraper conveyor and six screw conveyors.

22. Twenty cake racks on wheels.
23. Two thousand woollen press mats.
24. Two hydraulic filter presses.
25. 1,000 yards filter cloth.
26. Two duplex steam pumps for filter presses.
27. Four tanks. Two for crude oil and two for filtered oil.
28. Two rotary oil pumps for pumping filtered oil to oil store tanks.
29. Two oil tanks.
30. One engine.
31. Two Lancashire boilers, 250 lbs. pressure. Working pressure: 150 lbs.
32. Piping, shafting, belting, etc.

SCHEME (2).

1. One attrition mill.
2. Two sets crushing rolls.
3. One steam-jacketed kettle.
4. One meal measuring and cake forming box.
5. One cage filling press.
6. One cage discharging press.
7. Four finishing presses.
8. Six movable pressing cages.
9. One travelling carriage.
10. Six sets press plates.
11. Six sets high and low pressure distribution valves.
12. One double cake breaker.
13. One cake trimmer.
14. Two power pumps.
15. One oil strainer tank (570 gallons.)
16. One pair low and high pressure accumulators.
17. Two 150 h.p. horizontal tubular boilers.
18. One engine.
19. Two oil storage tanks (each 5,000 gallons).
20. Feed pumps, feed water heaters shafting, belting, etc.

SCHEME (3).

Similar to Schemes (1) and (2) but hydraulic presses to consist of four cage presses and eight Anglo-American or open plate presses of meal. Complete accessory machinery for filtering, etc., and storage not quoted.

NOTE ON INDIAN HEMP.*

THE true hemp, *Cannabis sativa* (Russian hemp) is not grown in India for fibre, though a certain amount is cultivated, under strict supervision, for the sake of the drug it contains. Practically the whole export of Indian hemp consists of the fibre of *Crotalaria juncea* (Sann Hemp), though small quantities of Sisal Hemp (*Agave rigida* or *Agave cantala*) are also exported. The fibre of *Hibiscus cannabimus*, sometimes known as "Brown Hemp" but more commonly as "Bimlipatam Jute" is included under the heading "jute raw" in the Indian Trade Accounts. This fibre is mainly exported from Madras, the chief market being the United Kingdom.

"Sann hemp is a widely spread Indian crop and the plant is a papilionaceous legume; as is well known, it collects atmospheric nitrogen, through the agency of bacteria, which attach themselves to its roots. The Indian cultivator recognizes sann hemp as a crop which enriches his land and extended use for the fibre would involve a corresponding addition to the agricultural resources of the country. Indeed, under certain circumstances, the crop may realize the ideal, long aimed at by agriculturists, of combining a green manure with a revenue crop. So far indigo is the only crop which has approached such an ideal, but the possibilities of sann hemp in this direction have already been recognized by the Government of India." (*Industrial Hand-book*, 1919).

STATISTICS OF AREA AND YIELD.

There are no official forecasts of the hemp crop. A special enquiry was instituted by the Department of Statistics, India, in 1917 with a view to arrive at an estimate of the production of the hemp fibre in British India

* With acknowledgments to the *Indian Trade Journal* dated May 30, 1919.

in 1916-17. The following table gives the result of the enquiry:—

---	Area	Outturn	Average outturn per acre
	(Acres)	(lbs.)	(lbs.)
Madras	197,900	137,836,200	696
Bombay and Sind	150,900	111,674,900	740
Central Provinces and Berar * ...	161,100	119,240,600	740
United Provinces...	176,900	106,117,200	600
Bengal	32,300	21,229,700	657
Punjab	49,200	20,280,700	412
Bihar and Orissa...	15,200	7,143,400	470
Burma	600	164,300	274
North-West Frontier Province ...	700	147,400	211
Delhi	500	177,700	355
Total	785,300	524,012,100	667

* No estimate of average yield being available the outturn has been calculated at the rate for Bombay.

THE PREPARATION OF THE FIBRE.

Indian Hemp fibre is stripped from the stalks of the plant. The stalks when cut are soaked in water then bruised with stones, then resoaked and so on until the fibre strips off easily. It is only in tracts where water is plentiful that the hemp can be soaked in clean water and the fibre obtained free from mud. In tracts where water is not plentiful, the stalks can only be soaked in muddy pools, with the

result that the dried fibre is found to be impregnated with dust.

THE ADULTERATION OF INDIAN HEMP.

The adulteration of Indian hemp has, for several years, been the subject of complaint from importers in the United Kingdom. In 1913, with reference to a representation from the London Hemp Association, the Government of India expressed the opinion that the remedy for the unsatisfactory quality of much of the hemp exported from India rested to a great extent with the buyers; and that, if a higher price were paid for clean hemp, and if hemp which contained impurities in appreciable quantities were refused, the evil complained of would disappear in due course. This opinion was endorsed by the commercial public, and the London Hemp Association was eventually informed that the only effective means of ensuring improvements in hemp exported to the United Kingdom from India was that buyers should insist on getting the clean article and be prepared to pay higher prices for it; and that the Government of India were unable to take any action in the matter.

Towards the end of 1916, the question was raised by the Home Office in correspondence with the India Office. The suggestion was made that Indian hemp could be more thoroughly cleaned before export than is the case at present, and that the grading might be controlled by legislation on the lines of the regulations in force in New Zealand and Manilla. The Government of India came to the conclusion, however, after consulting local authorities, that it was neither practicable nor necessary to have recourse to legislation in the matter. The Indian hemp crops vary considerably in character while the New Zealand and Manilla crops are more or less uniform, and it would, therefore, be necessary to prescribe in India an inordinately large number of grades. Moreover, it is understood that the

present system by which the buyer relies upon the established private marks of the better known shippers to guarantee him consistent grading, works satisfactorily. It was, however, considered desirable to discourage the shipment of dusty hemp as far as possible. It was no doubt the case that the dustiness of Indian hemp which was most marked in the grades known to the trade as "philibit" and "chandausi," was mainly due to retting in muddy water, and there might be difficulties in improving the facilities for washing the hemp in the districts where it was grown. The most feasible course to adopt would be to encourage the hackling or combing of hemp before export.

No suitable machinery for the hackling or combing of hemp appears to exist; and the cleaning has therefore to be done by hand hackling. Hackling is already done on a fairly extensive scale at Bombay, and the industry has received an impetus from the improved prices recently obtained for combed hems. The results of this combing are fourfold:—

- (a) The fibre is freed from dust.
- (b) The fibres are evenly retted by the combs and each Bundle or Hank after combing contains fibres of nearly equal length so that the hemp is thus ready to be worked.
- (c) The short ends of the hemp are combed out and are known as Tow. This article is essential to several industries and particularly to Shipbuilding.
- (d) Tonnage space is saved to the extent of the dust extracted.

EXPORTS FROM INDIA.

The following table, compiled from returns published by the Department of Statistics, India, gives a fair idea not only of the quantity of hemp fibre exported from India during the past five years and of the money value such exports represent, but also of the manner in which the trade is distributed among the various foreign markets:—

Exports of Raw Hemp from British India.

				QUANTITY.				
				Twelve months, 1st April to 31st March.				
				1914-15	1915-16	1916-17	1917-18	1918-19
				Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Hemp, Raw, (chiefly <i>sann</i>)—								
To United Kingdom	...	...	...	442,084	514,414	657,462	225,951	384,962
„ Germany	...	...	...	42,118	...	...	...	...
„ Belgium	...	...	...	79,275	...	...	...	...
„ France	...	...	...	27,636	3,172	14,599	2,038	34,183
„ Italy	...	...	...	50,337	75,992	33,956	8,869	1,004
„ United States of America	...	...	...	...	...	8,111	49,948	40,625
„ Other countries	...	...	...	28,777	14,689	18,085	19,910	28,646
TOTAL.....				670,227	608,267	732,213	306,126	489,420
Share of Bengal				353,425	327,666	341,197	126,735	268,597
„ Bombay	...	...	...	270,172	233,585	344,956	151,797	174,812
„ Sind	...	...	...	675	6	...	45	...
„ Madras	...	...	...	45,955	47,010	46,060	28,139	46,011
TOTAL.....				670,227	608,267	732,213	306,716	489,420
				VALUE.				
				Twelve months, 1st April to 31st March.				
				1914-15	1915-16	1916-17	1917-18	1918-19
				Rs.	Rs.	Rs.	Rs.	Rs.
Hemp, Raw, (chiefly <i>sann</i>)—								
To United Kingdom	...	...	...	66,72,086	89,14,122	1,47,26,777	65,21,452	1,21,40,547
„ Germany	...	...	...	7,32,081	...	...	...	...
„ Belgium	...	...	...	10,77,514	...	...	...	...
„ France	...	...	...	4,11,889	55,705	2,89,005	46,000	8,98,069
„ Italy	...	...	...	6,43,997	10,72,902	5,93,063	1,43,467	14,314
„ United States of America	...	...	...	...	...	1,67,775	8,71,331	6,88,539
„ Other countries	...	...	...	4,05,767	2,11,013	3,33,236	3,61,774	9,38,153
TOTAL.....				99,43,334	1,02,53,742	1,61,11,856	79,44,024	1,46,79,622
Share of Bengal				46,76,744	52,80,149	69,71,098	25,00,642	56,81,781
„ Bombay	...	...	...	45,41,490	41,87,879	81,87,538	48,10,453	79,53,425
„ Sind	...	...	...	9,180	300	...	1,225	...
„ Madras	...	...	...	7,15,920	7,85,414	9,53,220	6,31,704	10,44,416
TOTAL.....				99,43,334	1,02,53,742	1,61,11,856	79,44,024	1,46,79,622

Exports from Calcutta.

The Sann hemp exported from Calcutta is classed in the trade under three grades, *viz.*, (1) Benares Sann Hemp, (2) Green or Raigarh Hemp, and (3) Bengal Sann. It is estimated that in normal times about 100,000 bales (350 lbs. each) of all grades are exported annually from Calcutta, the approximate quantities of each grade exported being as specified below:—

- (1) Benares Sann Hemp. Normal exports about 85 per cent or 85,000 bales; obtained from Benares and certain districts in the United Provinces.
- (2) Green or Raigarh Hemp. Normal exports about 10 per cent or 10,000 bales; obtained from Raigarh and the Central Provinces generally.
- (3) Bengal Sann. Normal exports about 5 per cent or 5,000 bales; obtained from certain districts in Bengal.

The bulk of export trade is handled between October and May.

The standard qualities of each grade as exported from Calcutta are as follows:—

Sann Hemp	...	{ No. 1. No. 2. No. 3. No. 4.
Green Hemp	...	{ No. 1. No. 2. No. 3. Tow
Bengal Sann	...	{ No. 1. No. 2. No. 3.

Exports from Bombay.

About 80,000 full pressed bales of 3½ cwt. each are exported annually. The following descriptions are exported:—

Philibit.
Central Provinces and Raigarh.
Devgad.
Gulbarga and Warangal.
Khandeish.
Godra.

They are classified under the following grades:—

Philibit Fine, No. 1, No. 2.
Central Provinces—Fine Etarsi.
Fine Sewnee.

Devgad—

Gulbarga—

Extra Fine Jubbulpore.
Fine Jubbulpore.
No. 1 "
No. 2 "
Extra Fine.
Fine.
No. 1.
No. 2.
No. 3.
Salsi P. L.
Fine.
No. 1.
No. 2.

All descriptions of hemp are combed in Bombay and exported under private marks, in the form of Combed Hemp and Tow. Certain descriptions are exported as combed and tow only.

The proportions are roughly as follows:—

Central Provinces and Raigarh.	50 per cent.
Philibit	... 20 "
Devgad	... 17 "
Gulbarga and Warangal	... 5 "
Khandeish	... 3 "
Godra	... 3 "

The proportions borne by each subdividing grade depend on the crop. In a good year there is an abundance of Fine and Extra Fine, and in a bad year a large proportion of No. 1 and No. 2.

Exports from Madras.

The following varieties or descriptions of hemp are exported from the Madras Coast:—

Upper Godavery from Sirivansa and Dumugudem District.
Gopalpore from Gopalpore.
Warangal ,, Warangal.
Cocanada ,, Districts South of the Lower Godavery.
Singarem ,, Rajahmundry.
Palinara ,, Narsapur.

A rough estimate of the proportions borne by each grade to the total exports from Madras is as follows:—

Upper Godavery	... 8 per cent.
Gopalpore	... 35 "
Warangal	... 20 "
Cocanada	... 38 "
Singaram	... 1 "
Palinara	... 1 "

Upper Godavery varieties are usually packed separately; the hemp from Siravansa District being both longer and of lighter colour than that from Dumugudem. Dumugudem hemp is a good variety but usually short. Gopalpore in cleaning usually gives—

Fair	...	75 per cent
Brown	...	15 "
Shorts and Two	...	10 "

under which descriptive marks the hemp is usually packed.

Warangal, Cocanada, Singarem and Palinara varieties are not assorted in cleaning, the colour being very uniform; but the Tows and Shorts are packed and shipped separately.

Sann hemp as a substitute for flax.

At the time when the shortage in flax was being severely felt, the use of suitably prepared sann hemp as a substitute for flax in canvas was advocated by the Fibre Expert to the Government of Bengal. The *Industrial Hand-book* (1919) issued by the Indian Munitions Board, says.—“In contrast to jute, sann hemp has the advantage of being a fibre of the same class as flax, and articles made from sann hemp would, therefore, while probably not so good as those made from flax, be of a markedly more durable nature than jute goods. The necessary samples were prepared and the opinions expressed, while by no means universally favourable, leave no doubt that softened sann hemp is capable of being made into a decidedly better class of canvas than jute. Moreover, two large commercial concerns have taken up the matter and one of these has arranged for the importation of flax spinning machinery, which is to be used for the working of sann hemp and, in part, for flax when it becomes available. It is necessary to state that the uses of sann hemp will extend to all the coarser materials which have hitherto been made from flax, such as hose pipes, belting, canvas and, possibly, shoemaker's thread. There seems little doubt regarding any of those, excepting the thread, for the making of which flax has a considerable advantage in its longer ultimate

filaments (flax : sann = 25 : 10). Encouraging results have, however, been obtained. Thus a new industry is likely to be brought to the banks of the Hooghly as a direct result of the war.”

Future Prospects.

The *Indian Trade Journal* of September 10, 1915, (p. 412), published an article on “The Hemp Trade and the War.” It was stated therein that, prior to the war, the United Kingdom's requirements of hemp were mainly supplied (in order of importance) by the Philippine Islands, New Zealand, India, Russia, Italy and Germany. It may be explained that the imports into the United Kingdom which are classed as hemp include several different fibres. Those from Russia and Italy are true hemp, those from the Philippines and Manilla are known as “Manilla hemp”, those from India are of different species but mainly Sann hemp, those from New Zealand are known as “New Zealand hemp,” *Phormium tenax*, and those from Mauritius “Mauritius hemp,” *Furcroea gigantea*. True hemp is obtained from the plant *Cannabis sativa*. The fibre is a satisfactory substitute for flax, and except for the finer linens, is used for medium grades of nearly all goods commonly made from flax. It is also largely used for cordage, ropes, and in the manufacture of carpets and rugs. It was also pointed out that it was not unlikely that the world would look to countries such as India for the supply of fibres which may be used as substitutes for the European varieties of hemp, owing to anticipated difficulties in the preparation of the hemp crops of Russia and Hungary. In view of the political events which have taken place in Europe since the above article was written, it may be taken that the world's markets cannot in future reckon with any certainty on the Russian product. The future prospects of the Indian Hemp Trade are good, in the absence of competition from Russia, provided that the fibre is exported in a clean condition free from sand and dust.

MYSORE ECONOMIC CONFERENCE AND ITS WORK.*

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THIS is a brief survey of the Conference work done by the Committees of the conference since its inception. It has been published at the request of the members of the Standing Committee with a view to explain succinctly some of the outstanding results achieved by the activities of the Conference and to enable the members to take stock of the work already done and make suggestions regarding the development of work in the future. Further detailed information as to the several schemes investigated by the Committees and the general work under each year's programme is given in the annual reports presented at the various sessions of the Conference and the monthly proceedings of the Committees.

General Conference.—The first session of the Conference was opened by His Highness the Maharaja in June, 1911. Including the session of 1918 there have been in all nine sessions. At the first session the preliminaries of the work to be done by the Conference and the Committees were settled and at the subsequent sessions several schemes and subjects of importance were discussed and resolutions thereon submitted to Government.

The General Conference and the Central Office have mainly attended to the organization and co-ordination of the activities of all the agencies connected with the Conference and the distribution of work among the various groups.

The existing procedure for the work of the Conference is as follows:—

At the annual session programmes of work are prepared for each of the Central Committees and the District Committees and

some understanding is arrived at with the allied Departments regarding the subjects to be taken up by the Departments and the Committees respectively for investigation during the year. All important schemes after being completed are placed before the Standing Committee and submitted for orders of Government with the recommendation of that Committee. Proposals coming from the District Committees are first dealt with by the Central Committees. Members of the Conference are allowed to send up propositions individually for consideration at the Conference. If details have to be worked out, the proposals are referred to the Committees concerned with the approval of the Conference. The Committees also appoint Sub-Committees from the members of the Committees and others. In this way the association of a large number of persons with the activities of the Conference has been secured. For investigation of special subjects, Committees have the power to appoint experts and have engaged them on a few occasions. In some cases, Committees have undertaken experiments to develop schemes included in their programmes.

A list of subjects discussed and recommendations made by the Conference and its Committees from the year 1911 to 30th June, 1917, was circulated to the members at the last Birthday Session. This will be revised as soon as the present session is over and published so as to provide the members with a permanent record of the recommendations made by the Conference.

The total number of subjects discussed is 580. Of these, recommendations were submitted to Government on 370 subjects, the other subjects being incomplete were referred to the Committees and Departments concerned for further investigation. The total number of subjects which after discussion and investigation took concrete shape and resulted in fully developed schemes being

*A note prepared for the tenth session of the Mysore Economic Conference.

adopted is 210. The most important amongst them being:—

1. Industrial survey of the State.
2. Organization of a Department of Industries and Commerce.
3. Establishment of the Bank of Mysore,
4. State aid to industries.
5. Establishment of the Chamber of Commerce.
6. Development of Hand-loom Weaving.
7. Industrial and Commercial Museums and Bureau of Commercial information.
8. Development of Sericulture.
9. Horticulture.
10. Dairy Farming.
11. Improvement of Live-stock.
12. Large Landed Estates.
13. Establishment of the Mysore University.
14. Establishment of Public Libraries.
15. Improvement of the Education of Backward and Depressed Classes.
16. Development of Technical Education.

Standing Committee.—Thirty-six meetings of the Standing Committee have been held since December, 1913. Since July, 1915, all the three Committees meet as an Enlarged Standing Committee for about an hour or so before the Central Committee meetings. The primary function of the Standing Committee has been to take stock of work done by the Central and District Committees every month, co-ordinate the work of the Departments and the Committees and consider subjects falling under the purview of more than one Committee.

Central Committees.—The outlines of work done by each of the Central Committees and important schemes brought into operation at their suggestion and recommendation are referred to below.

Education Committee.—The Committee has been constituted to deal with problems relating to Education and enlist the co-operation of the people in the investigation of important questions bearing on the development of education in the State.

The activities of the Committee may be classified as follows:—

- i Keeping in touch with educational developments throughout the

world, studying educational methods and organization and investigating and formulating improvement schemes.

A list of questions that may be usefully taken up for study and discussion is maintained and arrangements have been made to work them up progressively.

- ii Carrying on experiments with new schemes.
- iii Collection and publication of useful information.

Government having decided upon a policy of rapid educational expansion in all the grades, the Committee has specially co-operated in suggesting measures for increasing literacy throughout the State in encouraging the education of Backward and Depressed Classes and evolving a system of properly co-ordinated education in all the grades, the development and extension of technical and professional education and the spreading of enlightenment among the masses by means of books, pamphlets, bulletins, lectures and visual instruction.

Up to the end of April 1919, sixty-seven meetings were held by the Committee.

The following are some of the important schemes investigated by the Committee.

Establishment of the Mysore University.—The scheme was first taken up by the Committee and some of the preliminary details were also worked out by them.

Primary Education.—On the recommendation of the Committee, increasing facilities were given for developing primary education and large grants were made by Government for the purpose. A Regulation for the introduction of compulsory education was passed on the lines of the Bill drafted by the Committee and the scheme is being developed gradually. A detailed scheme for the education of adults was also prepared by the Committee.

Industrial and Technical Education.—A comprehensive scheme for the development of Industrial Education was submitted to Government in the year 1912. As a result of these recommendations the Mechanical Engineering School was established at Bangalore and the Chamarajendra Technical Institute was also developed. A scheme of Practical Instruction was sanctioned. District Industrial Schools were opened at Bangalore and Mysore and similar schools have been sanctioned for other District Head-quarters and some have been opened. The Committee also attempted to teach some industries to adults by opening special classes in towns and cities. A scheme for Commercial Education was also drawn up by the Committee.

Women's Education.—A scheme for the remodelling of women's education so as to enable them to complete their higher education in Kannada and to suit the curriculum to their requirements in life has been prepared. Proposals were also submitted for the improvement of the Maharani's College, the training of women teachers and the provision of scholarships to encourage education among women, for starting hostels and improving the efficiency of women's education in all the grades.

Education of Backward Communities.—Recommendations were made by the Committee for increased facilities for the education of Backward Classes and a special grant was sanctioned by Government, for award of scholarships. The scheme in the initial stages was worked out by the Committee with the help of the District Committees and Taluk Progress Committees.

Visual Instruction.—A comprehensive scheme for providing useful general instruction not only to the young but also to the adult population, especially the illiterate in the districts and for creating interest in mechanical devices and appliances was submitted to Government and has been sanctioned.

Public Libraries.—On the recommendation of the Committee, Public Libraries and Reading Rooms were established in the cities of Bangalore and Mysore. The scheme has since been extended to smaller towns and rural areas and portable libraries are also being circulated from village to village. Separate sections for the use of ladies with small museums for the benefit of children in the two cities are being organized.

Publication of Books.—A scheme for the publication of books for general education in Kannada was prepared. Arrangements have been made for publication of books with the co-operation of the Karnataka Sahitya Parishat and the Kannada Popular Science Association.

Science Education and Popular Lectures.—Arrangements were made by the Committee through the help of the Kannada Popular Science Association for delivering lectures on various subjects at Bangalore and Mysore.

Home Industries.—The details of the scheme which was initiated by the Industries and Commerce Committee were transferred for further development to the Education Committee. The Institute at Bangalore and Mysore aimed at helping the existing home workers in the cities by supplying raw materials at cheap rates, collecting and selling the finished articles and demonstrating the use of improved implements and methods. The scheme was transferred to the Department of Industries and Commerce with effect from 1st April, 1919.

Vocational Guidance.—An expert Committee was appointed last year; forty-one applications for vocational advice were disposed of. A manual of courses and careers was also issued and some of the chapters of the manual are being translated into Kannada. A pamphlet "The Schools of Public Life in Mysore" is in the press.

Miscellaneous.—The other schemes investigated by the Education Committee are the introduction of the Boys Scout movement, Medical Inspection of Schools, Improvement of Physical Culture, Religious and Moral Instruction, School Excursions, the systematisation of scholarships and education in Fine Arts, the starting of a ladies' magazine, the starting of a children's magazine, hostel accommodation for Anglo-Vernacular Schools, the establishment of a Music School, etc.

In addition to investigations and deliberative work, the Committee was also entrusted with the working of several special schemes such as the Home Industries Institute, Home Education Classes, the management of Public Libraries at Bangalore and Mysore and the development of District and Rural Libraries. The Committee also supervised the work of the Itinerant Lecturers at the Cities of Bangalore and Mysore and in the Districts.

Agricultural Committee.—The Committee was constituted to study problems connected with Agriculture and carry on in co-operation with the Department, investigation into schemes relating to the improvement of Agriculture in the State and the amelioration of the economic condition of the raiyat.

Up to the end of April, 1919, seventy-two meetings were held by the Committee.

The subjects dealt with by the Committee may be classified as follows :—

1. Introduction of improved methods of Agriculture.
2. Development of Sericulture.
3. Growth of commercial crops.
4. Relief of Agricultural indebtedness.
5. Improvement of live-stock.
6. Fruit growing on profitable lines.
7. Establishment of nurseries for fodder and fuel.
8. Statistical and economic enquiries.

9. Collection and spreading of information.

Introduction of Improved Methods of Agriculture.—A scheme has been formulated for increasing agricultural production in the State by 50 per cent during the next ten years. A scheme for the formation of large landed estates was sanctioned at the instance of the Committee, and blocks of land not less than fifty acres in extent are being granted by Government on the recommendation of the Deputy Commissioners of Districts on condition of improved methods being introduced thereon. The question of the consolidation of holdings is being investigated. Schemes for the improvement of commercial crops such as sugar-cane, cotton, tobacco, mulberry, etc., and their cultivation on a large scale have been formulated.

Development of Sericulture.—Prior to 1912, little attention was paid to the development of Sericulture. The Committee took up the subject that year. At the instance of the Committee, an Italian Expert was appointed and a scheme for the development of the industry in all its branches on up-to-date lines was prepared. Steps have been taken for the establishment of a large number of demonstration farms, the opening of a Central and other Schools, supply of disease free seed on a large scale, the improvement of rearing and reeling. The Committee attended to sericultural development until June, 1916, when a separate department was constituted. During the five years the Committee was in charge of the work the industry was able to regain much of the ground it had lost owing to disease among silkworms and other causes.

Horticulture.—The development of fruit cultivation has received special attention from the Committee. Arrangements have been made to train sons of raiyats owning lands and others in the cultivation of fruits and vegetables. Rules for granting loans, supplying plants, expert advice and other

concessions to encourage the extension of the industry have been passed. Fruit cultivation has also been introduced into several new localities.

Improvement of Live-stock.—A comprehensive set of rules framed by the Committee for the encouragement of stock breeding has been approved by Government. The appointment of a live-stock expert has been sanctioned. Experiments in sheep-rearing have been conducted with success.

Rules for the encouragement of dairying by the grant of loans have been sanctioned and applications have been dealt with by the Committee. Of these three Dairy Farms are reported to be working satisfactorily.

Nurseries for Fodder and Fuel.—The Committee have worked a scheme for developing village forests and recommended the starting of nurseries at District Headquarters.

Relief of Agricultural Indebtedness.—An enquiry was conducted in the Districts at the instance of the Committee on the economic condition of the raiyats and information collected as to the resources and debts of raiyats in typical villages.

A scheme for the development of Agricultural Co-operation has been prepared. Proposals have been submitted for the starting of a Land Bank.

Growth of Commercial Crops.—Special measures have been adopted for the encouragement of tea and camphor cultivation and improvement of other crops such as, cocoanut, sugar-cane, etc.

Miscellaneous.—Estimates of agricultural production have been compiled and standards of development in agriculture framed. Vernacular courses in agriculture have been introduced at the Hebbal Agricultural School on the recommendation of the Committee. The establishment of an Experimental Farm under the Krishnarajasagara for the development of sugar-cane cultivation was suggested by the Committee.

A scheme of Agricultural Education in the Middle and Higher Grades was also considered by the Committee.

Bulletins on local agricultural practices have been issued from time to time and interesting selections from technical Journals have been circulated in print.

Industries and Commerce Committee.—The Committee has been constituted for dealing with problems connected with the development of Industries and Trade in the State. There was no separate Department of Industries and Commerce before the Committee was appointed. In fact, one of the most important questions dealt with by the Committee was the organization of a Department of Industries and Commerce, which was sanctioned by Government in the year 1913 at its instance. The Committee has taken an active part in the investigation of questions relating to the development of industries and trade in the State and the initiation of several important schemes. Its main functions are :—

- i. Carrying on preliminary investigations, enquiries, demonstrations, experiments in connection with the development or pioneering of industries, obtaining expert advice wherever necessary and preparing special schemes for the sanction of Government.
- ii. Framing of schemes for financing industries and recommending to Government financial aid to deserving bodies or persons who intend starting industries
- iii. Encouraging the formation of industrial and commercial associations.
- iv. Collection and publication of industrial and trade statistics.

and v. Spreading information by bulletins.

Up to the end of May 1919, seventy-two meetings were held by the Committee and

forty-six Sub-Committees were constituted to investigate and work the details of the several schemes.

Among the larger schemes brought into existence at the instance of the Committee may be mentioned—

- i. Establishment of the Bank of Mysore, the preliminary details of which were worked out by the Committee.
- ii. A scheme for financial assistance to industries in which definite suggestions were made regarding the various modes of granting State aid to industries and introducing a system of Takkavi Loans for industrial development.
- iii. Establishment of the Chamber of Commerce.
- iv. Industrial survey. Mr. Sambasiva Iyer was placed on special duty and an elaborate report has been issued.
- v. Development of handloom weaving. The establishment of a weaving factory was sanctioned and also a scheme for the demonstration and introduction of fly shuttle looms by supplying them at concession rates. The markets for woven goods were also investigated.
- vi. A scheme for an Industrial and Commercial Museum at Mysore and branch museums at District and Taluk Headquarters was sanctioned for the improvement of industries and trade in the State. Opening of an Industrial Depôt to assist skilled artisans in the State to improve the quality of articles made by them and extend the market for such goods was recommended by the Committee.

vii. Establishment of Pharmaceutical works, a Soap Factory, and development of the Paint industry.

viii. Improved methods of Jaggery production by means of power-driven sugar-cane installations and use of power appliances in connection with Agriculture.

ix. Development of the oil industry by the introduction of Anderson's Oil Expeller, Hydraulic Presses and Chemical Extraction Plants.

x. Extension of State Life Insurance to the general public and the scheme of Village Savings Banks.

xi. Development of Cottage, Rural and Home Industries, Industrial Training and establishing District workshops.

xii. Improvement of Weights and Measures.

The Committee has also made suggestions regarding the establishment of the Sandalwood Oil Factory, Cotton and Wool-Spinning Mill, Paper Manufacture and development of large chemical and mineral industries.

Among other important industries investigated by the Committee are the following:—

- i. Manufacture of paper, bamboo pulp and matches.
- ii. Establishment of Pencil Factory.
- iii. Development of leather industry.
- iv. Establishment of laundry industry.
- v. Development of lac cultivation.
- vi. Manufacture of Catchu.
- vii. Further development of Minor Industries.
- viii. Establishment of the Straw Board Factory.
- ix. Financing industries and external trade in Mysore.

Propogandist Work.—Thirty-nine bulletins have been published on various subjects.

Dasara Exhibition.—The management of the Dasara Industrial and Agricultural Exhibition is also vested in the Committee and four All-India Exhibitions and one Local Exhibition have been held under the direction of the Committee.

Economic Journal.—For the dissemination of useful information in connection with the activities of the Conference, monthly journals both in English and Kannada were started in January, 1915. The Kannada Journal was converted into weekly in February, 1917. The receipts and expenditure of the Journal are shown under General Conference. The net expenditure to Government on the Journal before the weekly was started was Rs. 6,741 per year. Since the weekly journal came into existence the expenditure has risen to Rs. 10,247 part of which is due to abnormal conditions such as the cost of paper and enhanced rates for printing.

District Committees and Tuluk Progress Committees.—These Committees with the help of the District Economic Superintendents investigated local wants, disseminated useful information and worked out the following schemes for the Central Committees:—

1. Extension of primary education, by the opening of new schools, increasing the attendance of the existing schools, opening night schools, practical instruction classes and home education classes.
2. Administration of the Backward Classes Scholarships.
3. Popularisation of improved methods of Agriculture by the introduction of improved implements, supply of good seed, manure and the holding of demonstrations.
4. Formation of large landed estates.
5. Sericulture.
6. Horticulture.
7. Dairy Farming.
8. Stock Breeding.
9. Development of Commercial Crops.

10. Installation of power plants.
11. Development of hand-loom weaving by demonstrations and supply of fly-shuttle looms at concession rates.
12. Establishment of tile factories.
13. Improvement of Cottage and Rural Industries.
14. Collection of Essential Statistics.

A great deal of the awakening in the districts and some of the practical results attained have been due to the activities of these bodies. They have also played an important part in raising funds for educational and other purposes in the districts.

Expenditure incurred by the General Conference and the Central Committees.—The expenditure incurred by the General Conference and the Central Committees is given in Appendix A, B, C, D, E, and F.

Conclusion.—From the above retrospect, it will be seen that in arousing interest in economic questions, in suggesting new lines of development, in concentrating attention on practical schemes and in helping Government to give effect to their policy regarding the material and moral advancement of the people, the Conference and the agencies connected therewith have proved themselves of great value both to the Government and the allied departments. Its constitution has enabled it to work in entire harmony with the departments concerned and it has successfully co-operated with them in investigating new questions and in preparing the ground for the introduction of schemes and improvements of far reaching importance.

The scope for the introduction of new schemes and original investigations being limited, the functions of the Committees in future are likely to become more and more advisory in character. As changes in the world conditions have brought forward many new problems for solution and altered the aspects of many old questions, there is much work to be done of a substantial character in the future in consolidating the activities already commenced, in keeping in touch with development elsewhere and bringing the resources of the entire organization to bear on the attainment of the best practical results.

General Conference.

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APPENDIX B.

District Committees and District Economic Superintendents.

Items of Expenditure		1911-12		1912-13		1913-14		1914-15	
		Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
1	Officer	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
2	Establishment	...	...	5,760	3,594	12,750	6,363	20,060	18,286
3	Travelling allowance	...	...	3,240	3,628	6,800	3,325	5,700	9,433
4	Small experiments	...	...	4,000	3,956	9,550	5,858	12,409	16,137
5	Progress Committees	...	...	3,000	1,349	3,000	...	...	...
6	Hon. for lectures	...	...	...	...	2,000	2,400	4,300	4,200
7	Contingencies	...	...	...	...	...	...	...	...
8	Conference charges	...	...	2,000	2,468	4,000	2,304	3,840	5,006
	
	Total.....	11,500	4,278	18,000	14,995	38,100	20,250	46,300	53,062
				1915-16		1916-17		1917-18	
		Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
1	Officer	24,400	22,970	24,400	25,026	25,000	24,849	26,520	17,658
2	Establishment	7,200	12,484	12,000	10,321	20,000	17,815	15,830	9,888
3	Travelling allowance	22,000	20,609	21,900	26,839	26,000	30,497	32,880	18,354
4	Small experiments	6,000	5,424	5,000	4,960	5,900	4,879	...	...
5	Progress Committees	5,000	4,600	4,000	3,800	2,800	4,700	5,000	2,000
6	Hon. for lectures	...	...	5,900	5,676	4,000	5,562	3,120	3,537
7	Contingencies	5,000	4,879	7,100	4,368	7,000	9,701	9,600	3,891
8	Conference charges	...	...	...	...	600	600	600	375
	
	Total.....	69,600	70,966	80,300	80,990	91,300	98,603	93,550	55,703

APPENDIX C.

Mysore Economic Journal.

Items of Expenditure		1911-12		1912-13		1913-14		1914-15	
		Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
1	Salaries	Rs. ...	Rs. ...	Rs. ...	Rs. ...	Rs. ...	Rs. ...	Rs. ...	Rs. ...
2	Establishment ...	...	...	...	...	...	...	2,400	1,955
3	Travelling allowance	...	...	...	...	...	...	1,380	1,032
4	Printing charges	...	...	...	...	...	...	150	...
5	Printing paper	...	...	...	...	...	...	1,000	1,256
6	Blocks and illustration	...	...	...	...	...	...	1,140	240
7	Advertisements ...	...	...	...	...	...	...	1,000	300
8	Hon. to contributions	...	...	...	...	...	...	400	147
9	Contingencies ...	...	...	...	...	...	...	1,000	714
		...	...	...	...	...	...	1,525	912
	Total.....	...	...	...	...	...	...	9,995	6,556
		1915-16		1916-17		1917-18		1918-19 Up to end of March	
		Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
1	Salaries	5,580	5,580	6,300	5,942	8,040	6,480	7,080	6,086
2	Establishment ...	1,860	1,859	2,136	2,512	3,396	3,164	3,400	2,268
3	Travelling allowance	300	81	300	199	600	276	700	320
4	Printing charges	4,750	4,224	3,450	3,655	5,000	3,918	4,000	3,845
5	Printing paper	2,200	4,043	3,300	1,313	4,500	5,215	5,000	4,464
6	Blocks and illustration	720	757	700	189	2,064	736	1,000	175
7	Advertisements ...	...	...	100	...	...	...	...	...
8	Hon. to contributions	2,000	1,810	2,100	2,130	3,500	1,825	2,320	1,783
9	Contingencies ...	1,225	940	950	1,013	1,800	830	1,300	943
	Total.....	18,635	19,294	19,336	16,953	28,900	22,444	24,800	19,893

APPENDIX D.

Education Committee.

Items of Expenditure	1911-12		1912-13		1913-14		1914-15	
	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
1 Salary	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
2 Establishment	6,049	7,300	7,000	4,500	5,400	4,500	5,236
3 Travelling allowance	...	939	1,300	1,297	1,300	1,346	2,000	2,307
4 Printing charges	...	1,272	1,900	945	2,000	1,492	2,500	1,959
5 Hon. for translation	80	100	164	1,000	609
6 Do lectures	100	126	500	226
7 Payment for expert opinion	17,000	...	...	...	100	264	500	430
8 Contingencies	240	168	1,500	1,490
9 Public library	1,179	700	536	1,460	1,050	2,000	1,850
10 District libraries
11 Rural libraries
12 Travelling libraries
13 Home Industries Institutes, Bangalore and Mysore
14 Cottage and Home Industries, Bangalore and Mysore
15 Higher Industrial Schools
16 Backward Scholarships
17 Vocational guidance
18 Physical culture class
19 Pop. Science lectures
Total.....	17,000	9,439	11,200	9,858	9,800	10,010	14,500	14,107

Note.—The extra expenditure was met out of allotments made in the Education and Industries and Commerce Departments.

APPENDIX D—concl'd.

Education Committee.

	Items of Expenditure	1915-16		1916-17		1917-18		1918-19	
		Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
1	Salary	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
2	Establishment	7,200	7,200	5,600	5,456	5,800	5,784	6,000	4,500
3	Travelling allowance	5,800	3,132	9,500	9,654	5,800	5,039	7,300	4,183
4	Printing charges	1,600	1,583	2,800	2,628	2,900	3,374	2,700	1,600
5	Hon. for translation	1,000	967	1,000	1,984	2,200	2,654	2,200	3,110
6	" lectures	600	366	100	78	400	248	300	193
7	Payment for expert opinion	...	...	800	252	300	291	...	...
8	Contingencies	1,000	750	800	964	1,000	1,544	...	...
9	Public library	2,400	1,158	2,300	2,354	2,600	2,469	4,300	3,378
10	District libraries	...	24,465	...	23,437	...	25,944	...	14,044
11	Rural libraries	...	...	...	...	...	5,000	...	300
12	Travelling libraries	...	...	...	6,455	...	7,493	...	...
13	Home Industries Institutes, Bangalore and Mysore	...	...	...	...	...	5,746	...	9,810
14	Cottage and Home Industries, Bangalore and Mysore	...	...	...	22,843	...	25,801	...	18,378
15	Higher Industrial Schools	...	...	...	9,771	...	9,583	...	9,063
16	Backward Scholarships	...	...	...	...	...	408	...	1,195
17	Vocational guidance	...	...	...	...	...	78,217	...	...
18	Physical culture class	...	...	...	...	...	996	...	1,467
19	Pop. Science lectures	...	...	...	1,457	...	128	...	868
	Total.....	19,600	39,621	22,900	87,333	21,000	180,719	22,800	73,132

Note.—The extra expenditure was met out of allotments made in the Education and Industries and Commerce Departments.

APPENDIX E.

Agricultural Committee.

Items of Expenditure		1911-12		1912-13		1913-14		1914-15	
		Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
1	Salary ...	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
2	Establishment ...	...	2,700	4,200	4,171	10,100	8,828	15,720	12,547
3	Travelling allowance ...	...	1,541	3,600	2,896	6,780	7,900	11,412	11,608
4	Printing charges ...	...	1,466	3,400	2,025	8,000	7,868	9,500	9,271
5	Payment for expert opinion ...	...	...	1,500	899	1,000	2,020	1,000	1,837
6	Hon. for translation ...	...	...	1,000	...	200	462	1,000	404
7	Experiments, etc. ...	...	...	1,000	116	300	248	500	399
8	Fodder and fuel plantations ...	...	387	5,000	1,747	3,000	5,050	3,000	2,652
9	Implement depots ...	21,000	...	...	...	...	...	...	...
10	Agricultural Associations ...	...	1,042	2,000	2,337	1,500	1,642	3,000	3,046
11	Scholarships ...	...	795	...	...	2,000	1,909	...	1,170
12	Preparation of bulletins ...	...	955	5,500	3,548	4,500	3,906	5,000	5,240
13	Contingencies ...	...	...	1,000	442	1,000	632	2,500	2,506
14	Other charges ...	...	2,158	2,400	2,425	3,820	2,380	2,368	1,509
		...	...	7,000	...	...	...	...	7,520
Total ...		21,000	11,044	37,600	20,606	42,200	42,845	55,000	59,709

APPENDIX E—concl'd.

Agricultural Committee.

	Items of Expenditure	1915-16		1916-17		1917-18		1918-19 Up to end of March	
		Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
1	Salaries ...	Rs. 6,600	Rs. 4,085	Rs. 4,200	Rs. 4,684	Rs. 4,800	Rs. 5,014	Rs. 4,800	Rs. 3,600
2	Establishment ...	11,700	3,640	4,000	3,946	7,200	7,623	7,800	5,917
3	Travelling allowance ...	7,700	6,928	6,400	5,753	10,000	9,711	6,000	4,909
4	Printing charges ...	...	1,905	1,700	2,928	2,000	1,611	2,000	1,157
5	Payment for expert opinion ...	1,000	...	...	30	...	...	1,060	...
6	Hon. for translation ...	1,500	209	500	573	400	163	400	154
7	Experiments, etc. ...	...	...	400	262	2,000	3,075	3,150	2,059
8	Fodder and fuel plantations ...	...	...	...	...	...	...	7,500	245
9	Implement depots ...	4,500	...	...	47	1,000	485	1,000	436
10	Agricultural Associations ...	...	...	...	...	1,000	...	1,000	233
11	Scholarships ...	4,000	...	...	...	600	663	500	...
12	Preparation of bulletins ...	700	2,705	2,500	2,791	2,500	1,029	2,200	2,075
13	Contingencies ...	2,000	2,629	2,600	2,506	1,800	1,696	1,800	660
14	Other charges ...	9,600	...	...	...	...	...	...	...
	Total...	49,300	22,101	22,300	23,520	33,300	31,070	39,150	21,445

APPENDIX F.

Industries and Commerce Committee.

Items of Expenditure		1911-12		1912-13		1913-14		1914-15	
		Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
1	Salary	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
2	Establishment	...	7,700	9,550	8,525	6,490	6,492	11,300	10,769
3	Travelling allowance	...	1,326	2,000	1,745	2,180	2,271	2,460	2,661
4	Experiments	...	566	1,800	1,149	2,250	3,200	5,370	4,885
5	Payment for expert opinion	...	476	10,000	3,650	1,000	...	5,000	5,151
6	Special establishment	...	2,234	...	637	1,500	...	3,000	1,448
7	Printing charges	...	...	33,800	47,877	...	19,757	12,650	...
8	Stipends	...	...	...	714	800	...	2,000	2,239
9	Library and other charges	...	40,500	...	...	...	...	...	...
10	Deputation to foreign countries	...	...	...	...	700	...	500	873
11	Mysore Chamber of Commerce	...	...	...	...	...	...	...	...
12	Special schemes	...	...	...	...	...	...	...	...
13	Hon. for translation	...	...	...	...	200	...	500	207
14	Preparation of bulletins	...	...	...	...	6,500	...	200	26
15	Contingencies	...	5,259	5,050	3,918	1,280	2,497	4,020	2,356
Total.....		40,500	17,561	62,200	68,245	22,900	34,217	47,000	30,615

APPENDIX F—concl'd.

Industries and Commerce Committee.

	Items of Expenditure	1915-16		1916-17		1917-18		1918-19 Up to end of March	
		Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals	Budget grant	Actuals
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Salary ...	5,400	6,400	6,300	6,300	7,200	8,250	7,800	3,150
2	Establishment ...	2,960	3,024	2,800	3,191	7,800	6,615	6,550	3,760
3	Travelling allowance ...	2,200	2,693	3,800	2,814	2,300	1,295	2,300	1,714
4	Experiments ...	7,000	...	...	10,154	10,100	10,479	7,000	842
5	Payment for expert opinion ...	940	975	1,000	66	500	...	500	...
6	Special establishment ...	2,700	...	...	...	...	...	...	...
7	Printing charges ...	1,800	3,276	3,200	2,303	2,450	1,063	2,000	1,343
8	Stipends ...	2,000	45	1,000	1,604	1,000	1,243	1,500	830
9	Library and other charges...	...	541	2,150	403	600	231	600	157
10	Deputation to foreign countries ...	...	...	20,000	8,478	5,000	3,706	5,000	174
11	Mysore Chamber of Commerce ...	...	...	750	1,400	750	750	850	850
12	Special schemes ...	...	...	...	1,516	1,000	111	7,000	1,312
13	Hon. for translation ...	200	...	...	...	...	...	...	...
14	Preparation of bulletins ...	100	...	...	...	...	...	...	...
15	Contingencies ...	2,100	1,752	2,000	1,901	2,500	3,091	2,000	617
	Total...	27,400	18,706	43,000	40,130	41,200	36,834	43,100	14,749

SOME ASPECTS OF THE BRITISH BUDGET, 1919-20.

BY THE EDITOR.

THE British Budget for 1919-20 presented to Parliament by Mr. Austen Chamberlain marks a notable departure from the customary statement made annually in that House. Its outstanding feature is the definite adoption of a policy of Imperial preference. Though its application is limited, it may be taken that preference will play an important part in the Imperial Economic System in the years to come. From the statement made by Mr. Chamberlain, it is clear that preference will in the beginning apply to only a small number of articles. It is not apparent that it will extend to raw materials as well. It was a cardinal point of the original scheme propounded by Mr. Joseph Chamberlain that it did not stop short of articles of food; it extended to raw materials as well. The list of articles included in the present Budget for purposes of preference does not include raw materials as such. The articles it actually includes are:—Tea, Coffee, Cocoa, Sugar, dried fruits and Tobacco, all of which may be classed under the head of articles of food. Then there are the following articles:—Motor spirit, Cinema films, Clocks and Watches, Motor-cars and Cycles and musical instruments which are all manufactured articles. These two classes of articles exhaust the list. They do not include, as will be seen, raw materials, in regard to which the Dominions compete in the British markets with foreign countries. Will preference in the coming years be extended to these as well or as now kept within strict limits? Will it mean to the people of England not only dear food but also dear raw products for manufacturing purposes? It will be interesting to watch the future development of preference in the British Budget.

The mode in which preference is to be given is by reductions of duty in favour of Imperial products rather than by increase of taxation in the case of commodities coming from foreign countries. This is likely to give an impetus to British enterprise in the Dominions and to the development of trade relations with Great Britain in the coming years.

What this preference means to the Dominion producers can be seen from the following table indicating the sources of England's supplies of the articles included in the preference list:—

Sources of Supplies Affected by the
Imperial Preference.

	From Foreign Countries	From British Possessions
	£	£
Tea	1,750,179	12,032,726
Raw Coffee ...	2,558,417	362,438
Cocoa (Raw) ...	1,119,998	1,162,775
„ Prepared ...	1,837,253	2,105
Sugar	22,135,688	930,933
Dried Fruit ...	3,464,325	23,699
Motor Spirit ...	3,018,188	785,209
Wine	3,930,938	147,205
Tobacco (Manufactured).	1,272,108	51,372
Tobacco (Unmanufactured).	6,645,678	63,404
Watches	1,274,756	155
Clocks	499,307	5
Musical Instruments.	1,149,023	29,783
Motor Cars (Complete).	1,566,019	172,443
Motor Cars (Chassis).	1,892,293	2,172
Motor Cars (Parts)	1,214,300	6,133
Motor Cycles (Complete).	59,964	368
Motor Cycles (Parts)	105,543	146

In regard to tea, already nearly 90 per cent of it consumed in Britian is produced in the Colonies. Virtually preference in this case means reduction of the duty on tea—whether call such indirect reduction by the name of preference is a question. One effect, however, of preference will be to check speculation in the London market in connection with foreign tea. This tea has been brought over and kept in stock to release at a time when the price for common tea has touched a certain level. This speculation, if preference is persisted, will probably be killed. But it should not be forgotten that it only affects about 10 per cent of the whole tea imported into Great Britian, and that therefore the effect of preference on tea production in the Empire is not likely to be appreciably great. The case is very different in regard to coffee. 88 per cent of what is consumed in Great Britian is foreign grown and imported while, only 12 per cent is Empire Grown. As to cocoa, half of the total quantity consumed comes from the Dominions, while the other half foreign. In regard to sugar, the position is somewhat different. Cane-sugar industry has been practically killed by the German beet root product. As much as 96 per cent of what is consumed in Great Britian is imported from foreign countries—mostly from Germany and Austria Hungary—and only 4 per cent is British. Preference here is likely to act beneficially if it is followed with (or rather backed by) action in the Dominions and in India. It is a truism to say that India grows as much cane as can be required to meet its needs; but the methods of pressing are so primitive that the sugar actually turned out from it is hardly sufficient to suffice its wants. It has, therefore, become the largest importer of sugar in the world. Whether preference will have any effect on the Empire production of sugar is difficult to say. Suitably backed by the Dominion and India Governments, the people of

the Dominions and India ought to be able to grow more cane and what is of intimately greater importance extract the sugar from it in a less wasteful manner. Preference must be followed by *action* by Governments and *enterprize* on the part of the people in the Dominions and in India. At present the quantity of sugar available in the Empire for import into Great Britian is only 7 per cent of its total imports. Great Britian is an exceptionally good customer for sugar, and there is no reason why the quantity required by England—which cannot grow its own sugar and has perhaps the largest confectionary trade in the world—should not be supplied by the people of India and the Dominions. Unlike the United States, which grows its own sugar, England depends entirely on what it can import and the import has been mainly from Germany and Austria-Hungary. Nearly twenty-three million pounds worth of sugar were imported by her from these countries in 1913, the year before the war. During the period of the war, she imported first from Java and then from Cuba. The West Indies have supplied the 7 per cent imported into Great Britain; but obviously the industry cannot expand to any very great extent there. British Guiana might supply a good portion of what is needed by Britian but it has still to be opened up. Queensland in Australia is a cane-growing country but the want of labour there might stand in the way of the development of the industry. Thus India is the one country from which Britain can expect unlimited supplies. India could supply more than the quantity if only the cane grower in this country can be induced to extract the juice from the cane he grows a little less wastefully. As Dr. Hopkins remarked the other day in the House of Commons the amount of sugar-cane produced in India is more than adequate to supply its own needs, and not only that but also the needs of the whole of the United Kingdom and the British Empire. That is also

the declared view of the *Statist*, provided, of course, as we have said, the juice extraction is done on more prudent lines. A great effort in this direction is necessary and it should be put forth in the coming years. The following table which has been more than once published in the *Statist* shows the total production of cane-sugar in the British Empire in the season 1917-18:—

	Tons.
Demarara ...	120,000
Trinidad ...	75,000
Barbados ...	65,000
Jamaica ...	20,000
Antigua ...	30,000
Other British West India Islands ...	10,000
Total British West Indies ...	320,000
Australia ...	380,000
India ...	3,200,000
Egypt ...	120,000
Mauritius ...	250,000
Natal ...	110,000
Total for British Empire ...	4,380,000

In regard to the other articles included in the preference list, little need be said. 80 per cent of motor spirit imported into Great Britain is foreign; similarly 90 per cent of the motor-cars (complete) is foreign. Clocks have been imported almost entirely from Germany and watches, except for a trifle, from Switzerland. The imports of motor-cars from the Colonies into Britain was slight before the war, but probably in view of the development of this industry in Canada, preference may, perhaps, lead to better trade relations in this matter between England and that part of the Empire.

Two other features of the British Budget may be referred to before we conclude. One is the reduction of the excess profits duty by exactly 50 per cent—from 80 per cent to 40 per cent. When we remember that this duty was largely instrumental in raising prices all round its reduction cannot but be welcomed. We are, however,

more concerned with the principle involved in its imposition rather than the magnitude of the import itself. That the taxation of capital is not favored to-day in England may, perhaps, be inferred from the reduction. What the Government gained by it—nearly £300,000,000—it more than lost in the heavier prices it paid for its purchases. Whether the tax will be abolished in the future is a matter for speculation, in view of the cry that has been raised against its reduction. Already critics of the Budget have said that while the middle-classes were unable to live before it, now millionaires will be unable to die! Probably it will remain with us in an attenuated form for some years to come, if not like the income-tax stay with us for ever, the friend of every Chancellor and the foe of every tax payer. The abandonment of the luxury tax is another point to note. It is, as the *Times* puts it, one of those taxes which looked exceedingly promising on paper but when brought down to practicalities proved unworkable. Its failure in France was not lost on British financiers.

The vastness of the British Budget is disclosed in the figures. We give below the same in a succinct form for the benefit of our readers. The total revenue expected is £1,201,100,000 as against a probable total expenditure of £1,434,910,000, thus leaving a deficit of £233,810,000.

ESTIMATED REVENUE, 1919-20.

Customs as in Table V.	£117,650,000	
Proposed net addition,		
as in Table VII	... £1,350,000	
		£119,000,000
Excise, as in Table V	... £80,900,000	
Proposed net addition, as		
in Table VII	... 37,600,000	
		118,500,000
		£237,500,000
Estate, &c., Duties, as		
in Table V	... £31,000,000	
Proposed net addition,		
as in Table VII	... 2,500,000	
		£33,500,000

Stamps	...	...	12,000,000
Land Tax	...	...	600,000
House Duty	...	...	1,900,000
Income-tax (including supertax)	...	...	354,000,000
Excess Profits Duty, &c.	...	...	300,000,000
Land Value Duties	...	...	500,000

£702,500,000

Total Receipts from Taxes ... £940,000,000

Postal Service	...	...	£30,000,000
Telegraph Service	...	...	4,000,000
Telephone Service	...	...	7,000,000

£41,000,000

Crown Lands	...	...	650,000
Receipts from sundry Loans, &c.	...	...	9,750,000
Miscellaneous	...	...	209,700,000

Total Receipts from Non-Tax Revenue ... £261,100,000

Total Revenue ... £1,201,100,000

Deficit ... 238,810,000

£1,434,910,000

ESTIMATED EXPENDITURE, 1919-20.

CONSOLIDATED FUND SERVICES.

National Debt Services:—

Inside the Fixed Debt Charge	...	£29,800,000
Outside the Fixed Debt Charge	...	330,200,000

£360,000,000

Payments to Local Taxation Accounts, &c.	9,763,000
Land Settlement	... 5,000,000
Other Consolidated Fund Services	... 1,832,000

Total Consolidated Fund Services £376,595,030

SUPPLY SERVICES.

Army	...	£287,000,000
Navy	...	149,200,000
Air Force	...	66,500,000

Civil Services as in

Table IV ... £445,804,000

Add, Supplementary

Estimates to be presented ... 60,000,000

505,804,000

Customs and Excise, and Inland Revenue

Departments	...	8,537,000
Post Office Services	...	41,274,000

Total Supply Services £1,058,315,000

Total Expenditure £1,434,910,000

FINAL BALANCE-SHEET.

1919-20 (Estimate).

Expenditure	...	£1,434,910,000
Revenue	...	£1,201,100,000

Deficit ... £238,810,000

1918-19 (Actual).

Expenditure	...	£2,579,301,000
Revenue	...	889,021,000

Deficit ... £1,690,280,000

CHANGES IN TAXATION.

The following changes were proposed in taxation:—

The duties on spirits to be increased from 30s. to 50s. per proof gallon. (A bottle of whisky to cost 10s. 6d.)

The beer duty to be raised from 50s. to 70s. the standard barrel. (Beer prices to remain as at present.)

Excess profits duty to be reduced from 80 per cent to 40 per cent.

Death duties on estates exceeding £15,000 to be increased to a scale ranging up to 40 per cent on estates of two millions sterling.

Motor spirit licence duty of 6d. per gallon to be abolished.

Benzol to be exempted from taxation.

Luxury duty proposed last year to be abandoned.

Income-tax rates unchanged. Wound pensions and demobilisation gratuities not to be taxed.

IMPERIAL PREFERENCE.

It was further proposed that a preference be given to Empire products on existing Customs duties. The preference to be: One-sixth of the duty on tea, coffee, cocoa, sugar, dried fruits, tobacco and motor spirit; one-third of the duty on cinema films, clocks and watches, motor-cars and motor-cycles, musical instruments. A preference of from 6d. to 1s. per gallon was proposed on Empire wines and of 2s. 6d. on spirits. The preference to take effect from 2nd June for tea and from 1st September for the other goods. The Excise duties on chicory, sugar and tobacco to be reduced so as to correspond with the Customs duties on similar articles produced within the Empire.

PROSPECTS OF THE OLEO-RESIN INDUSTRY IN MYSORE.

BY RAO SAHEB M. RAMA RAO,

Special Forest Officer, Mysore State.

AMONG the indigenous forest trees, the following yield Oleo-resins:—(a) Yennemara, (b) Dhuma, (c) Sambrani, (d) Kai-dhupa, (e) Sal-dhupa and (f) Jalari-dhupa.

(a) *Yenne-mara of Manjarabad Ghats.*—This tree occurs only in the Manjarabad Ghats, but to what extent has not yet been definitely ascertained. For several decades past, the trees are tapped occasionally for small quantities of the Oleo-resin which is locally used as a rough varnish. It contains a valuable *Essential Oil* and resin, both of which are used for varnish and the oil as a substitute for *Copaiba balsam* in medicine. Mr. S. G. Sastry (Industrial Chemist) has recently valued the oil at Rs. 5 per lb., for experimental use in his soap works. It is, I believe, worth more when used as a substitute for *Copaiba balsam*.

We have to find out definitely our resources of this Oleo-resin by first ascertaining the existing number of tappable trees by a regular enumeration and secondly the annual quantity of Crude Oleo-resin that can be collected, by experimentally tapping sufficient number of trees in all the seasons of the year to determine the most suitable season and then decide whether sufficient quantity will be available for starting a Distilling Factory. The resin has a dirty green colour. If decolorised, it may be suitable for *sizing* paper, when our Paper Mill becomes an accomplished fact.

(b) *Dhuma Tree.*—Lakhs of this tree are reported to exist in the Shimoga

and Kadur Ghat forests. I have seen some gigantic trees in the Agumbe Ghats. The tree yields an Oleo-resin containing an *Essential Oil* and resin. As in the case of Yenne-mara, we have to ascertain by enumeration of trees and Experimental tapping what annual quantity of Oleo-resin can be collected from this tree.

The Indian Institute investigated Oleo-resins of this and Yenne-mara and has published the results. The essential Oil and resin are useful for making varnishes and in other minor industries.

(c) *Sambrani Tree.*—This occurs in gregarious patches in a few dry stony localities in Chamarajnagar and Heggaddevankote Taluks, in Chitaldrug District and elsewhere. Its resources have not yet been ascertained. It yields a gum-oleo-resin which contains a *gum* useful for *sizing* cloths, *turpentine* which is said to be as valuable as American turpentine, and *rosin* which is believed to be suitable for *sizing* paper, for preparing Shellac from Crude lac and for other purposes. Dehra-dun Forest Research Institute has investigated the subject and published recently a Bulletin on the methods of manufacture, uses of the products, etc.

(d) *Kai-dhupa*, and (e) *Saldhupa.*—These trees occur in the Ghat Forests of Hassan, Kadur and Shimoga. They yield the *black dammar* and *white dammar* of commerce. Both are used in varnish, for caulking boats and other purposes.

(f) *Jalari-dhupa.*—The Jalari occurs both in the Maidan and Semi-malnad districts, and yields a valuable Oleo-resin. At present, its Oleo-resin is not regularly collected

except in petty quantities for domestic use as incense. The Oleo-resin contains turpentine and resin.

All the foregoing Oleo-resins require the same kind of treatment in distilling and separating essential oil or turpentine and rosin and in refining those products, except in the case of Gum Oleo-resin of *Boswellia* in which the Gum has to be separated off by a different apparatus before its Oleo-resin is distilled. Should the supply of raw material of any one of the above six kinds is insufficient for starting a distilling Factory, then all of them may be worked in one Factory. I understand that the minimum quantity of Oleo-resin required annually is ten tons for starting a Factory on a Commercial Scale.

We have no data available in the Forest Department or elsewhere as to what quantities of Oleo-resin can be annually collected from each species. Regular tapping experiments have to be conducted and the Oleo-resins distilled and their products put on the market to ascertain their Commercial values before any scheme for working the Industry on a Commercial basis can be prepared.

Experiments, made in the past, on the tapping of Yenne-mara and Dhuma, were conducted in a crude and desultory manner and no reliable data as to yield per tree, cost of extraction, etc., are forthcoming.

For conducting the experiments in a systematic manner on scientific lines on each of the six species and to collect reliable data a Special Staff consisting of a trained Gazetted Officer and a couple of trained Rangers with a few subordinates and labourers will be necessary.

For distilling the Crude Oleo-resin and refining the products thereof in sufficient quantities for being commercially valued, a trained Chemist and necessary Laboratory facilities will be required.

On the whole, the preliminary experiments in collecting the Oleo-resin and its chemical investigation in the Laboratory may cost about Rs. 10,000.

ECONOMICS IN THE WEST.

Industrial Expansion in India.

London, 24th April, 1919.—More than once I have referred in these columns to the widespread ignorance that exists here as to the great industrial expansion that is taking place in India. In no direction is this weakness more manifest than in the comments that have been made on the International Charter of Labour which has issued from the Peace Conference. If we accepted some of the opinions expressed at their face value we should believe that we are moving rapidly towards a new heaven and a new earth in which Labour all the world over will be governed by a set of amiable regulations which will ensure for the worker a maximum of pay for a minimum of effort with abundant and well paid leisure. Even Mr. Barnes, the President of the International Commission from which the Charter emanated, seems to share the delusion that the West having given its edicts in these matters will henceforth find a docile world to respond to its behests. In an interview recently published in speaking of the question of the duration of employment he argued that it was immaterial whether the hours of labour should be identical in all cases. He proceeded: "In the East, for example, where people work in a lackadaisical way without system or organization, and under somewhat patriarchal methods the hours are elastic, irregular and often protracted, but they are not so productive as in highly developed, organized countries." Mr. Barnes is unacquainted with the East or he would not have talked in this strain. A visit paid by him to the Cotton mills of Bombay, the Tata or Bengal Steel Works and a number of other centres that might be indicated would speedily convince him that lack of organization or lackadaisical

methods are not the serious handicaps to modern Indian industry that he imagines. Equipped with the latest appliances of mechanical science the Indian artisan is, in truth, a very formidable rival of the British trade unionist with his rules restricting production and his often unfriendly attitude towards labour-saving machinery.

It cannot, of course, be denied that Indian and indeed all Eastern labour is less efficient man for man than labour in Western countries. If it were not so Western industry would be in a parlous condition. The question is whether the difference is a permanent one and whether it applies to so marked a degree where machinery is extensively used. My own impression is that the introduction of modern conditions is propoundly influencing the problem. Where machinery does the work it matters little whether the tender is an Oriental or an Occidental. One may not keep as good time as the other—though even on that point there is room for argument. But the output of the machine will be practically the same in one case as in the other. The Japanese have shown us what can be done with up-to-date equipment in the shipping line by turning out big ocean lines in what would have been record time in England a few years ago. What Japan is doing India can and will do. There must be no mistake on that point.

POST-WAR DEVELOPMENT.

Evidence accumulates of the wide reaching and beneficent effects of the war in stimulating industrial research and production. A case in point is laboratory glass. Before the great upheaval in 1914 there was not a single manufacturer of laboratory glass in this country. To-day practically all the laboratory glass used here is produced in Great Britain. The welcome change that has been made in the industry is due to the public spirited action of the Sheffield

University authorities who, as soon as the need was discovered, made plans for covering the deficiency, and worked with such resolution and scientific skill as to bring into existence a department of Glass Technology which proved the efficient instrument of production called for by the crisis. Now that the strain of the war period is relaxed there is a desire that the good work that has been done shall be carried forward in an industry established on more or less permanent lines. At present the cost of producing the laboratory glass in Sheffield is higher than the pre-war German standard and probably if left entirely to itself the nascent industry would wither and fade away before the blasts of foreign competition: but the Government probably will see to it that the Sheffield experiment is not thus disposed of, and we may confidently expect that if the promoters are given a little time to put their house in order they will be able considerably to reduce the cost of manufacture. However that may be there is an influential movement afoot for financing the industry on generous lines. The Government are expected to participate in this but the main sinews of war will be provided by Sheffield capitalists who have faith in the undertaking.

We have heard so much about the reluctance of British capitalists to embark upon new undertakings owing to the industrial unrest that it was quite refreshing to read in the columns of the *Times* a day or two since a long and interesting account of the manner in which the old munition factories are being connected to industrial purposes. If not literally a case of turning swords into ploughshares it is in some instances very near it. For example, one factory which a few short months since was turning out by the thousand Stokes bombs is now manufacturing ploughs and spare parts of agricultural machinery. Others are producing dynamos and electric fittings, "art" bronzes, drop

stampings, oil engines, and, the veracious reporter adds, "even lace." Ingenuity is a leading feature in these post-war developments. For example, one factory in the North-West area is converting fuse cases left over from war contracts into ornaments. This is accomplished by the addition of three legs and a coat of electro-copper. It is gratifying to find that female labour is not being left out of the account in these activities. There is a distinct desire to utilise as far as possible the services of all women who have proved themselves capable in the war period. In one instance where an aircraft factory is being re-adapted for civil uses and there is a necessary interregnum the women have been kept on making blouses pending the time when they will be able to resume their mechanical operations.

An unsinkable ship has long been the dream of the enthusiast, but it really seems to have come at last in sober earnest. Of course, the notion emanates from America. It is, however, satisfactory to add that it is from the British part of the continent that we are to have this novelty. The "unsinkable ship" promised is in reality a huge bundle of timber equipped with propelling machinery and given the outward form and some of the adjuncts of an ordinary steamer. A description of the vessel shows that timber is to be built upon a simple foundation tier above tier until the file reaches a certain height when a joist and foot will be provided in which rooms and comfortable accommodation will be found for captain, officers, and crew, and spaces for kitchen galleys and for the motor engines driving the twin screws which are to supplement sails. When fully completed this curious "ship" will have a cargo of 5,000,000 broad feet of timber, will displace 9,000 tons, will be 250 feet long, have a beam of 60 feet and a depth of 36 feet. The voyage from British Columbia to Great Britain *via* the Panama Canal is expected to occupy a month. Should the experiment prove successful we may

expect more of these unsinkable ships to appear upon the seas. There would seem to be room for them even in the Indian trade.

The operations of the great War served to bring into great prominence the value of iron ore deposits. It is, indeed, not too much to say that Germany was only able to prolong the war to the extent she did by her being able to tap Swedish sources of supply when her carefully built up reserves were exhausted. Now that we are able to survey the portion in the light of experience it is possible to congratulate ourselves on the fact that the British Empire possesses finer ore deposits than any country in the world. A writer in the *Industrial Supplement* of the *Times* gives an interesting account of these Imperial assets, and urges that as a matter of policy we should develop and utilise British ore wealth rather than rely for our raw material upon foreign sources. India is given a conspicuous place in the writer's article, and he shows very plainly how tendencies are rapidly carrying the country forward as a great iron and steel producing centre. But India is not alone in Imperial steel development. Canada is taking a leading share in the struggle and Australia is also well forward. Newfoundland, however, would seem to offer the best prospects as she has in her Wabana mines what are reputed to be the richest iron deposits in the world. "The ore here," the writer of the article says, "has a good percentage of iron and is low in sulphur though rather high in phosphorus which renders it unsuitable for the acid process of steel making. It is therefore used mostly for the production of basic steel." Even before the war Great Britain imported 1,00,000 tons of ore from Newfoundland. Under the new conditions there can be no doubt the resources of the oldest colony will be drawn upon to a much larger extent.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Starving a Fire by Means of a Blockade of Steam.

Washington, D. C., U.S.A., 10th May, 1919—That the answer to a perplexing engineering problem is often a ridiculously easy one—after it has been found—involving merely the application of some perfectly well known principle, has seldom been better demonstrated than in the case of a huge Louisiana gas well fire recently. The well in question, which had been flowing at the rate of forty-four million cubic feet per day with a head-pressure of fifteen hundred pounds to the square inch, caught fire from an explosion in the well house. While the velocity and pressure of the gas stream were sufficient to hold the flames at a height of one hundred feet from the ground, they spread at that altitude over an area of several acres and were accompanied by a deafening roar and a heat so intense as to hamper the efforts of the would-be extinguishers below.

After futile efforts to cap the well it was proposed to dynamite it with the idea of creating such a blast of air as would blow the head of flame off the stream of gas. But before doing this it was decided to give a New York expert a chance to put out the conflagration by less dangerous and destructive means. But when the latter arrived five days after the outbreak and proceeded with his preparations in a way that made it plain that he proposed to extinguish the fire by means of a jet of water from a house he was loudly jeered and was informed, seriously, that there was not enough water in the whole state of Louisiana to put out that fire. From their own point of view, indeed, his volunteer informants were correct, entirely; smothering the fire with water in the usual manner of the city fire departments

would have been a ridiculous undertaking. But the expert had no such scheme in mind.

What he did was simply to bring up two hose lines of moderate size and play them from opposite sides so that their streams met in the non-burning stem of gas issuing from the well. They were then slowly elevated until they reached the base of the flames, where they were held. Within five minutes the cushion of steam formed was sufficiently heavy to cut off the gas supply from below and the fire was out!

While the general principle employed in this stunt is familiar to every high school student through the well-known experiment of holding a wire gauze over a Bunsen burner, lighting the gas above the screen, and observing how the flame will not communicate to the gas below this very flimsy barrier, its application to the gas well is a distinct departure, and one which takes much of the menace out of these conflagrations, which have been both frequent and destructive throughout the United States.

A KEYBOARD MACHINE FOR SORTING LETTERS.

There has recently been developed and is now in use in the New York and Chicago post offices a machine which, both in its manner of working and in its achievements, is to the business of letter distribution what the linotype is to the setting of type.

The operator sits at his keyboard, the letters flit in single file across his range of vision, he catches the post office or address on each passing envelope, strikes the proper key, and the machine attends to all the details of conveying that particular letter to the appropriate compartment, where it joins other letters having the same destination or routing.

In addition to the rank of compartments into which the letters are to be distributed, the machine consists of two essential parts—the key-board, and the erect carriers attached in a long series to the endless conveyor-belt

that passes over these compartments and back again under them. Each carrier has a row of triggers along the bottom, at the upper edge of each compartment stands a tripping mechanism. This mechanism occupies a different position on each compartment, while all the separate triggers on each carrier are independently adjustable. The letter drops out of the carrier only when all the triggers which have been set are tripped, and of course it is possible to set the triggers on any carrier so that they will be tripped at a given compartment, and at that compartment only.

This indicates clearly the general *modus operandi* of the machine. Just as every key of a typewriter is connected alike with the space bar and with its own particular type bar so that each stroke performs the general operation of spacing and the specialized one of printing, so in this machine each key is connected with the general mechanism for sliding the letter over into the carrier which happens to be standing opposite the board, and also with its own particular apparatus for setting the triggers upon that carrier to the particular combination that pertains to that key and to its corresponding compartment.

Once inserted in its carrier and the triggers on the latter properly set, the letter proceeds by jerks as each subsequent key is struck. It passes without recognition all the wrong compartments, but as it reaches the right one, for which the triggers holding it in place are set, it is released by the tripping of those triggers, and falls out and down into the compartment.

In the machine each carrier has four triggers, each capable of assuming four different positions, making possible sixty-four different combinations, and hence as many different sortings. Plainly, however, the principle is susceptible of infinite extension, both by increasing the number of triggers and the number of positions which each can take. The same mechanism on the

compartment's edge that trips the triggers restores them, after the letter has been dropped out, to the normal position in which they must be found by the setting apparatus as they pass the key-board on their next round. The machine is thirty feet long. Of course, the power for operating it is furnished by electric current; the pressing of the key in each case simply closes the circuit, as in the electric adding machine or typewriter. While so far it is used only on letter mail, it is planned eventually to construct machines for use in sorting newspapers and parcels.

THE AUTOPLANE—A LIMOUSINE FOR LAND AND AIR.

A luxurious limousine with a highly-finished body and with its three occupants sitting in elaborately and comfortably upholstered seats, dashing along a road or even over a field at the rate of 45 miles an hour, and then, with a slight increase of speed, taking to the air by virtue of its short wings and soon reaching a speed of 65 miles an hour and showing all the ease of manœuvring which belongs to the modern airplane—all this would seem to be a description of the perfected aerial bus or autoplane of a decade hence. Yet it is the delineation of the autoplane which was exhibited at the recent Pan-American Aeronautic Exposition held in New York, and which, from the popular standpoint at least, might well be regarded as the big surprise of the occasion.

The autoplane has been designed by Glenn H. Curtiss and his engineers, and is undoubtedly the first attempt ever made to combine automobile engineering with aerial practice in order to develop a vehicle for practical and fashionable use. The machine is a modified triplane, with the planes slightly staggered. The two upper planes have a span of 40 feet 6 inches, while the bottom plane is 23 feet 4 inches; and the chord of the former is 48 inches, and that of the latter is 42 inches. A gap of 39 inches is left between the planes, and the stagger is 11 inches.

The all-over height is 10 feet, length 27 feet, and the possible load 710 pounds.

The body of the autoplane is of aluminum, while the windows are of celluloid. The interior, with its elaborate upholsteries and tapestries, compares favourably with that of the high-priced limousine; so, with the single exception of a slight reduction in size, the appointments leave nothing to be desired.

The body has been somewhat streamlined in order to reduce the head resistance, and if anything this adds to its smart appearance.

The power plant—a 100-horsepower, eight cylinder motor—is placed under the hood in front of the autoplane, following usual automobile practice, and the shaft is extended to the rear of the body where the power is transmitted by a chain-drive to the four-bladed propeller located on a line with the top of the body. The circular radiator, which provides water cooling for the engine, is placed in front of the hood and adds greatly to the automobile-like appearance of the machine. Still another feature in this direction is the thermometer cap of the radiator and the starting crank.

The autoplane travels over the ground much in the same manner as the conventional motor car, and can be steered by means of the front wheels which are equipped with the usual steering mechanism. The front wheels move in unison with the aerial rudder; and all four are sprung on concealed rubber shock absorbers, which adds to the running qualities of the machine during land travel and alighting. Despite its apparent bulkiness, the autoplane has been demonstrated to be quite practical for the purpose intended.

CEMENT FROM SUGAR BEETS.

Extensive experiments in this country have resulted in the production of an excellent cement as a by-product of beet-sugar refining. The first step in the production of sugar from beets is boiling them. It has heretofore been customary to throw away as valueless the scum formed on the cauldrons.

But, through a series of experiments, it has now been discovered that this scum contains large quantities of carbonate or lime. It has been found that 5,000 tons of the carbonate can be recovered from every 70,000 tons of the beets. To this quantity of the carbonate 1,100 tons of clay are added, the resultant product being a cement which, according to competent authorities, is of "perfect quality." The beet-scum is pumped into large reservoirs and allowed to evaporate for a certain length of time before being mixed with the clay. It is then stirred or beaten for an hour before being fed into a rotary oven such as is used in making Portland cement.

AUTOMATIC FILM WINDER FOR HAND CAMERAS.

While it is true that the amateur film camera of to-day has been developed to a point where it is merely necessary to "press the button," and the rest of the photographic process usually takes care of itself, the fact remains that the film must be turned following the pressing of the button. If this is not done, the next exposure is superimposed on the first, and the two exposures are ruined. With a view of eliminating the bother incident to turning the film there has just been patented an ingenious automatic "film shifter" for cameras. Briefly stated, this device consists of a spring mechanism for shifting the film to bring a new surface into position, and a means for connecting this mechanism with the shutter so that it will operate immediately after the functioning of the latter. With this handy mechanism in use it will become possible for the photographer to snap two or more views in quick succession, which is often desirable but not practicable with the present manually-wound film cameras.

ELECTROLYSIS IN PIPES AND CABLES.

The damage done annually to pipes and cables, underground, as well as to metal structures in the United States by electrolysis amounts to many millions of dollars.

There are very few water, gas or lead cable systems that are not more or less subject at some points to electrolytic damage from stray currents. Moreover, the loss does not consist merely in the shortening of the life of such structures; electrolytic damage is one of the causes of the leakage of water and gas from distribution systems. The failure of such systems on account of electrolytic action may also involve various dangers to the life and health of human beings.

According to the United States Bureau of Standards, more than twenty-five separate and distinct methods of dealing with the electrolysis problem have been proposed and experimented with from time to time. Some of these methods are said to be useless and even harmful. The Bureau of Standards has been studying the subject of electrolysis mitigation for the past seven years, and has aided in installing complete mitigating systems in several cities of the country. The bureau makes somewhat detailed tests in each of these places at least once a year to make sure that the protective systems are being properly maintained. An extended series of experiments has recently been undertaken in the city of Springfield, Massachusetts, with the so-called three-wire system of electric railway operation—a system which offers considerable promise for the mitigation of electrolysis troubles under certain conditions frequently met with in cities.

AN ELECTRIC HEATING UNIT THAT LOOKS LIKE A TWO-FOOT RULE.

To light up a remote dark corner or a detached building it is a simple matter to extend an electric lighting circuit and add another lamp or group of lamps, according to the conditions and amount of light desired. This same feature of flexibility and ease of extension can be taken advantage of, in the way of heating such places as crane cabs, pump and valve houses, signal and watch houses, theater ticket booths, and various other locations where, because of exposure

or physical conditions, heat (or additional heat) is required. This has been made possible through the development of a rugged electric heater unit that looks more like a two-foot rule than anything else. These "units" are simply connected to a lighting or power circuit like so many lamps and may be distributed (like lamps) where they will do the most good. The entire nickel-chromium resistor or heating element is buried in an enclosure of mica, around which a steel jacket is placed and sealed under an hydraulic pressure of about twenty tons. Two insulated eyelet holes are provided for mounting and two connector posts serve for the making of connections to the circuit.

Traffic officers, crane operators, and signal men have employed this type of electric unit for keeping their feet warm. It is possible to keep other parts of the body warm with heavy clothing, but the feet usually suffer. When units are used as above a heavy perforated metal plate is supported about two inches above the floor, with a unit or several units placed between, allowing an air space between the units as well as between the units and the surface above and below to permit circulation. A current of warm air then passes up through the perforations. The units, being only three-sixteenths of an inch thick and one and one-half inches wide, can be used in a very small space.

NEW PERMANENT MAGNET STEEL.

A new steel of considerable importance has been made in the United States for the past year, the direct outcome of the war. It is a new, permanent magnet steel, a substitute for the older steel, known as tungsten magnet steel, used exclusively for this purpose before the war. Not long after the war began and the price of tungsten advanced, efforts were made to find a steel that would be cheaper and also as efficient as the permanent magnet steel then being used, containing from five to ten per cent tungsten and sometimes even up to twenty-five per cent. This demand was insistent from both magneto makers and electric companies making electric meters, because the tungsten magnet steel was reaching prohibitive prices. It was even stated that automobile makers were substituting batteries instead of magnetos because American steel makers could not make as good magnet steel as foreigners—manifestly an incorrect statement.

ALFRED T. MARKS.

NOTES.

The tenth session of the Mysore Economic Conference, held at Mysore during the Birthday week last month proved an eminently successful one. The President's Address first passed in review the work of the Conference since its inception and also briefly summed up what had been attempted in the industrial field in Mysore before its establishment. It then indicated briefly the scheme of organization proposed for the Conference as a permanent institution in the State. The discussions on the scheme lasted through the whole of the first day's sittings. Final orders on the matter have just been issued.

Sericulture is receiving much attention, in which connection the work of the Nanking University for improving the breed of silkworms should be noted. Endeavours are being made to introduce or to expand the industry throughout the province, every district having been ordered to start a training establishment for the purpose. Special attention is being paid to the matter in Chinkiang, where the rich waste lands are said to be very suitable; also in Yangchow and in Haichow. In the latter district some 800,000 mulberry trees have recently been planted. The chief obstacle to the extension of the industry is the arbitrary limitation of the number of cocoon hongs in each district, which prevents the silkworm breeders from disposing of their cocoons to the best advantage and thus tends to restrict supplies.

A PRESS COMMUNIQUE dated Simla, the 28th May, 1919, says:—The Foreign Office have instructed consular authorities in countries concerned to cease the issue of Certificates of Interests. These Certificates will, therefore, no longer be required for goods

imported into British India. Certificates of Origin and Interest which are prescribed for goods imported from certain European countries will however continue to be required for goods imported into British India.

President Wilson in a cabled address to Congress on Tuesday said in part the question which stands at the front of every country amidst the present great awakening is labour. We cannot go further in the present direction. We cannot live our right life as a nation or achieve proper success as an industrial community if capital and labour continue to be antagonists instead of being partners. That bad road is no thoroughfare to real prosperity. We must find another leading not merely to accommodation, but also to genuine co-operation and partnership, based upon real community of interests and participation in control. The genius of businessmen and sound practical sense of workers can certainly work such a partnership out when they realise what they see and sincerely adopt a common purpose. The new spirit and method of organization are not to be brought about by legislation so much as by common counsel and the voluntary co-operation of capitalist, manager, and workman. Many great industries prostrated by the war wait to be rehabilitated in many parts of the world where what is lacking is not brains or willing hands but machinery, raw materials and capital. I believe that business men, merchants, manufacturers and capitalists will have the vision to see that prosperity in one part of the world ministers to prosperity everywhere. Our new merchantship may prove very welcome. Our great shipyards opened to the world will prove immensely serviceable to every maritime people in restoring the tonnage wantonly destroyed in the war.

In the House of Commons Sir Edward Nicholl suggested that following the introduction of Imperial Preference the Government might make representation to the Government of India that British manufactures entering India should receive reasonable preference over foreign manufactures.

Mr. Fisher replied that the Government of India would consider the bearing of Imperial Preference on their present tariff arrangements.

In the House of Commons, replying to Mr. Norton Griffiths, Mr. Fisher stated that including the hundred million war contribution the war expenditure of the Government of India to the 31st March was about £127,800,000 sterling. A further contribution was proposed by the Government of India and was at present under consideration. Indian Princes and others had contributed £2,100,000 sterling in cash, besides placing at the disposal of the Government of India considerable further sums for the purchase of horses, motors, comforts for troops, etc.

The *Times* Manchester correspondent dealing with the report of the Indian Cotton Committee says that Lancashire spinners point out that the staple will not improve unless the seed improves and the summarised report does not indicate the means by which the seed can be kept pure. Exception is taken to the statement in the report that cotton of $1\frac{1}{16}$ inch staple will spin 34's twist and 44's weft in Lancashire mills. It is asserted that staple for three yarns must be $1\frac{1}{8}$ inch.

The 'Bharat Itihas Sanshodhak Mandal' which was started in Poona in 1912 to encourage research work in Indian History and to collect material for such work, celebrated its seventh anniversary in Poona on May 30, and 31 and June 1. During these seven years of its existence the work of the association has been confined more or less to the History of the Mahrattas.

But even here the association has not been able to produce any research work of great value. Perhaps this is due to the paucity of workers of the right sort. The association has, however, done some good work in the matter of collecting material for the History of the Mahrattas. It now owns, says the last report, a collection of some 30,000 papers and a thousand other writings; some 125 pictures and photographs of historical interest; 10 copper plates; 150 coins and other articles. It also owns a library of some two thousand and more books. The special feature of this year's anniversary was the opening of the western wing of the projected building of the association. The ceremony was performed on the morning of May 30, by Shrimant Babasaheb Pantsachia the heir-apparent of Bhor. In a short neat speech the prince paid a tribute of respect to research workers like the late Mr. Kirtane, the late Justice Ranade and others and impressed upon the people assembled there the importance of research work in Indian History and promised his wholehearted support to the association. Among the papers read during the days of the anniversary were those written by eminent men like Prof. Rajwade, Dr. Gune and others.

The summary tables of the Agricultural Statistics of British India for the agricultural year 1917-18, just published by the Department of Statistics, India, show that the total area sown in the year 1917-18, was 265 million acres (including 37 million acres cropped more than once), the same as in 1916-17. This total area may be classified under the two main heads food crops (219 million acres) and non-food crops (46 million acres). Of the food-crops, the area under wheat increased by nearly one and a half million acres in 1917-18, that under gram by one million acres, and that under barley by half a million acres. The decreases are mainly under bajra ($2\frac{1}{2}$ million acres), jawar ($\frac{3}{4}$ million acres), rice ($\frac{1}{8}$ million acres), and other food-grains (one million acres). Among the non-food crops, the main increases are under cotton $1\frac{1}{2}$ million acres), linseed ($\frac{1}{4}$ million acres) and rape and mustard ($\frac{2}{3}$ million acres), while the area under sesamum decreased by about $\frac{2}{3}$ million acres and groundnut by $\frac{1}{8}$ million acres. The total area irrigated decreased by 2 million acres as compared with that of 1916-17.

The effect of the war on agriculture.

Agricultural year	Population (1911 Census) Millions.	Acreage (Million acres)			Average acreage per head of population		
		Food crops	Non-food crops	All crops	Food crops	Non-food crops	All crops
1913-14 (Pre-war year.)	240	202	44	246	'84	'18	1'02
1915-16	240	215	40	255	'90	'16	1'16
1916-17	240	220	45	265	'91	'19	1'10
1917-18	240	219	46	265	'91	'19	1'10

As compared with the pre-war year the area under food crops at the end of the last agricultural year, June, 1918, was 8 per cent more than in the pre-war year owing to the increase on account of the war demands for wheat and gram. In regard to non-food crops the increase in the same period was 5 per cent, chiefly on account of demand for oilseeds, indigo, and fodder crops. The *per capita* acreage of foreign countries is also of interest. The figures for the United States of America, Canada, the United Kingdom, France and Germany before the war were as follows:—

United States of America	... 2'97
Canada	... 5'98
United Kingdom	... 0'39
France	... 1'49
Germany	... 0'94

The financial correspondent of the *Times of India*, writing on the great financial and industrial activities now progressing in Bombay, says that the latest enterprise talked of is a powerful British Indian combination for the production of finished steel goods from raw materials produced at Sakchi, and another scheme maturing is a project to connect the island of Bombay with the mainland opposite by means of a tunnel under the harbour and creating a new and bigger Bombay, there with docks and factories, drawing their motive power from the

vast hydro-electric power stations in the Western Ghats. Yet another is a project to manufacture aluminium out of bauxite on a commercial scale with the aid of the hydro-electric power. A big reclamation in Back Bay to relieve the congestion in Bombay is under the consideration of the Government of Bombay. There are daily rumours about the starting of new exchange banks and insurance companies, and all projects enumerated would cost well nigh Rs. 100 crores. It is felt in the city of Bombay that when all these projects are launched capital will be attracted from all corners of India, and there will be but little difficulty in raising the vast sums required. The support given to the recently floated companies has not been confined to Bombay city and Presidency, but has come from every part of India, and Bombay feels certain of the financial backing of the whole of India in all sound enterprises which it starts. The Indian industrial renaissance has begun, and Bombay seems destined to take a leading part in it.

The Department of Statistics has issued the following press notes regarding the prices of country produce and salt in India in the middle of May 1919:—The wholesale prices of cereals and pulses in India in the middle of May 1919, showed a rise of 4 per

cent as compared with the preceding fortnight, but it showed an increase of 88 per cent. (unweighted average) as compared with the average of the prices which prevailed at the corresponding date in the last three years. The weighted average showed a rise of 33 per cent. The price of rice rose by 60 per cent, Barley prices increased by 55 per cent, (unweighted average,) the weighted average showing a rise of 68 per cent. The price of jawar rose by 109 per cent, (unweighted average,) the weighted average showing an increase of 121 per cent, Bajra prices advanced by 111 per cent, (unweighted average,) while the rise by using the weighted average was 97 per cent, Gram showed a rise of 85 per cent. The average price of arhar dal increased by 87 per cent. The prices of ghi and raw sugar gur in India showed a rise of 37 and 57, respectively. The average price of salt in India advanced by 9 per cent.

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The following is a summary of the available information relating to the Industrial resources of the Idar State in the Bombay Presidency:—*Stone quarries at Shivgad near Himatnagar.*—These quarries are the principal industry of the State; the stone is a superior kind of sandstone which is suitable for building purposes and finds a good market in Gujrat and Bombay.—Among the untapped resources of the State may be mentioned the following:—*Asbestos and Steatite.*—Deposits of these two minerals have been found in a hill between Kundol and Devni Mori in the Bhiloda Taluka of the State. *Mica.*—The mica mine is situated at Dobhada in the Vadali Taluka of the State. *China Clay.*—This exists along the bank of the Subarmati river near Eklara in the Idar Taluka of the State. *Manganese ore.*—This occurs near Bhemapur and Dhaniwada in the Meghraj district of the State. *Silica.*—At Vadali. *Granite.*—At Idar and Samlajee.

GLEANINGS.

In the trade returns of British for April, 1919, published by the Department of Statistics, India, imports amounted to £9,588,000, an increase of £439,000 and exports including re-exports to £15,021,000, an increase of £2,883,000, as compared with the corresponding month of 1918. There was a large decrease in the exports of food, drink and tobacco (mainly food-grains) which decreased by £2,303,000. Raw materials and articles mainly unmanufactured increased by articles wholly or mainly manufactured by £1,752,000 and £2,310,000. During April of the pre-war year 1914, imports amounted to £9,664,000 and exports including re-exports to £13,869,000.

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According to a new Hungarian law, 80 per cent of war profits exceeding 100,000 kronen falls to the State. For sums not exceeding 100,000 kronen the war profits tax is as follows:—20 per cent on the first 10,000 kronen, 30 per cent on the following 10,000 kronen, and after that 40 per cent on the next 20,000 kronen, 50 per cent on the following 20,000 kronen, 60 per cent on the following 20,000 kronen, and finally 70 per cent on the next 20,000 kronen. Exemption from the increased war profits tax is granted to those persons whose yearly income does not exceed 25,000 kronen. The law comes into force as on 1st March.

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Information has been received from His Majesty's Government that the Allied and Associated Governments have decided that after midnight of April 28th, all Black Lists of firms and persons which they have published or compiled shall be withdrawn and that all disabilities attaching to trade and communication with firms or persons on such lists shall cease to operate. The Allied and Associated Governments reserve right to re-introduce

all or any of such Black Lists should such action become necessary. The Statutory List and the China and Siam White Lists are accordingly withdrawn with effect from the 29th April, 1919.

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Under the auspices of the American Asiatic Association it is proposed to hold an International Exposition of Asiatic Products in New York City in the spring of 1920. A pamphlet giving details of the exposition and its scope as well as information concerning the charges to be made for space, etc., has been received from the American Consulate-General, Calcutta, and may be seen at the office of the Director-General of Commercial Intelligence, No. 1, Council House Street, Calcutta, by parties interested.

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It is announced for general information that the following instructions for the issue of licences for the export of mica have been issued to Collectors of Customs:—(1) Exports of mica of all descriptions are permitted under licence to the United Kingdom, as at present. (2) Exports of all sizes and qualities of mica splittings and block, other than first and second qualities of clear and slightly stained ruby block of all sizes, are permitted under licence direct to other British and to allied destinations.

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Proposals are to be made for starting next session within the University of London, a special two years course for intending journalists and instituting a University Diploma in Journalism for such students. Leading members of the University have been formed into a committee for the purpose in conference with the Institute of journalists, the appointments Department of the Ministry of Labour and of the Board of Education.

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A Press Note issued by the Department of Statistics, India, says:—The Government of India have just addressed local Governments and Administrations on the collection

of statistics of wages with special reference to agricultural wages and to the wages paid in India's chief industries. The collection and publication of these statistics will, it is proposed, be done annually in the Department of Statistics.

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Sir Dinshaw Wacha has calculated that there were 13'6 yards of cloth for consumption in India per annum per head of the population in 1913-14, as compared with 9'28 yards, the annual average of the five years which ended on 31st March, 1910, or a shortage of 4'32 yards per year per head. The figures explain the cry of shortage and high prices of cloth.

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It is now recognised that the hope of crippling Germany during the War by blockading her cotton supplies was illusory. From very early days in the War she relied on wood cellulose as a basis for her explosives. From wood pulp the German factories made the finest possible tissue paper, and by nitrating this converted it into explosive.

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Germans are paying £7 for suits of clothes made from straw, paper, wood-fibre and peat. The cloth wears fairly well. Underlinen, bed-sheets and upholstery materials are now made from paper. Sweden is altering a number of cotton-spinning machines to be able to spin paper by German methods.

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The Minister for Labour has ordered an inquiry into the measures realized or projected in French munition factories for changing their works from a war to a peace basis.

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Japan exported 11,680,000 yen (say £1,168,000) of coconut oil and imported 13,050,000, or £1,305,000 worth of copra last year.

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The number of paper-making mills in England is about 233 and the number of work people employed about 50,000.

SPEECHES AND PRONOUNCEMENTS.

INDIA AS A SUGAR PRODUCER.

Present High Price of Sugar.

The following is a note by Dr. C. A. Barber, Government Sugar Expert, on the Possibility of India Producing its own Sugar or Becoming an Exporting Country :—

There is a marked shortage in the supply of sugar all the world over. This appears to me to be due to two main causes. In the first place, there is a rapidly increasing consumption *per capita* in all countries, and, secondly, the huge supplies of beet sugar, hitherto exported from Germany, Austria, and France, and have been entirely cut off by the war. The world's pre-war consumption was about 18,000,000 tons yearly, and beet and sugar-cane were credited with about 9,000,000 tons each. The price of sugar is at present extremely high, and I regard as probable that the longer the war lasts the higher will it rise.

India has, as is well known, imported increasing quantities of sugar during recent years, the annual total reaching not far short of a million tons. This imported sugar used to come largely from Austria, more recently Mauritius entered the market, but at present it comes almost exclusively from Java. The world's shortage has made itself felt in India in that the retail price has nearly doubled. Can India, taking advantage of this, produce this sugar herself? Can she indeed look forward in the future to becoming an exporting country as she once was?

There are two basal factors to be considered before approaching this question. We do not know whether this rise in price will be more or less permanent, or whether, after the war, it will sink again to its former low level, and it is not an easy matter to start a sugar factory, and several years elapse before the solid foundations of such an enterprise can be laid. Sugar-making in India must be considered to a large extent as a new industrial enterprise, and the difficulties in the way are much greater here than in any tropical country where the cane is grown. A vital question is the price of sugar after the war. I have formed the opinion that it will take many years before it sinks to pre-war level, if it ever does. And I base this opinion on the following facts and considerations :—

- (1) There is a constantly increasing consumption of sugar in all countries and one effect of the war will be, I think, to give an impetus to this. I regard this

increase as a permanent feature for many years to come.

- (2) It seems probable that the British Government will take some steps to prevent the free dumping of sugar on the market by countries at present at war with us, and this will inevitably lead to an enhancement of the price.
- (3) There is a considerable dislocation in the beet-growing area in Europe, because the war has selected for its activities the particular area where beet is grown, and there has been a great and calculated destruction of property there. There will thus be less total sugar available. There is considerable shortage, even in Germany in spite of the cutting off of the whole of her export trade, and one of the lessons of the war will, I believe, be that it will be considered economical for much more sugar to be retained for internal consumption, both by man and beast, than was formerly done, in all beet-growing countries.
- (4) With one exception of importance, to be noted below, I do not apprehend any immediate great extension of sugar-cane tracts in the tropics. The following is according to my idea, the position of affairs. There are a very great number of countries in which the sugar-cane is grown, and great strides have been made, both in field and factory, during the last twenty years of agricultural revival. It does not seem likely that further improvements or extensions will be more than sufficient to keep pace with the normal increasing demand, with one possible exception. For the sake of brevity, I will merely consider Java and Cuba, easily the greatest producers at the present time. There are many reasons for thinking that Java has nearly reached the limits of its production, as the past few years, in spite of strenuous scientific control, have shown decreased out-turn on the estates, and it is generally conceded that practically all the good sugar-cane land has already been taken up. With Cuba it is different. It is a great unknown factor. But there are interesting figures available which show that this country is worthy of special attention,

It is, indeed, quite within the bounds of possibility that, in the near future, it may dominate the sugar position much as Brazil has done that of coffee. It has not, moreover, as yet been possible or necessary to bring to bear on it the laborious scientific work which has characterised the industry in Java, Mauritius, the West Indies, Louisiana, Hawaii and other places. It will be seen from the following figures that there is a great future in store for the Cuban sugar-cane crop.

Cuba's Sugar Production.

Before the war of 1898, it had reached 1,000,000 tons a year.

1897-1900	...	200,000 to 300,000 tons,
1901-1903	...	600,000 to 1,000,000 tons.
1904-1912	...	1,000,000 to 2,000,000 tons.
1913-1916	...	2,000,000 to 3,000,000 tons.

It is considered by some that the output this year may reach 3,500,000 tons. There are, I believe, great areas of rich land at present unworked, and capital and machinery are pouring into the country. There is little doubt that an important factor is thus introduced, which may have great influence on the future price of sugar.

THE DIFFICULTIES IN INDIA.

- (1) The class of canes grown in India. Roughly speaking, there are two great sugar-cane tracts in India, which differ fundamentally. The first is that in which thick tropical canes can be grown to maturity, often as well as in Java or the West Indies, the second is entirely given up to thin, hardy, fibrous, indigenous varieties generally unsuited for the economic production of sugar.

The first region consists of the Peninsula (Madras, Mysore, the lower parts of Bombay and the Central Provinces) and, curiously enough, Assam and Burma. This is the natural sugar-cane tract and is, in the main, in the tropics. The inclusion of Assam is due to its moist, equable climate, in which it resembles, perhaps more than any other part of India, the cane conditions of such a tropical island as Antigua.

The second region is extra-tropical. Bengal and Behar may be regarded as transitional, but, after passing the Rajmahal range of hills, a great change is noticeable in the character of the flora and the crops grown. We soon enter the wheat region, as contrasted with that of sugar-cane. This region includes the alluvial plains of the Ganges and Indus and extends into the north of the Central Provinces and probably of Bombay.

Now it is a curious fact, and a constant source of mystification to those not conversant with Indian conditions, that the acreage under cane in the sugar-cane tract is comparatively insignificant, and at least 90 per cent of it is to be found in what I have summarily termed the wheat tract. This is one fundamental difficulty in any extension of sugar-making in India. I am not prepared to discuss its causes in detail here, but would merely suggest that in the past, with comparative lack of communications and the presence of hardy indigenous kinds, the need of sugar or its equivalent gur caused the sugar-cane to become an integral part of the cultivation in North India, whereas the smaller populations of the south were more accessible from outside and had other sources of supply in their palm forest. Furthermore, irrigation was necessary there, and the expenses generally of cultivating the thick tropical canes were out of all proportion greater than those of the northern kinds, and this undoubtedly checked expansion in the south.

- (2) Competition with gur. Besides the unsuitable character of the canes grown, a second difficulty in the way of extension of sugar-making in India is the fact that, beyond the importation referred to above, sugar is not an essential food of the people. They prefer jaggery or gur, an extremely impure form of sugar, which cannot, as a rule, be economically used as a raw material for sugar-making. The great mass of the sugar-cane grown in the country is used in the preparation of this commodity. The price is comparatively unaffected by the fluctuations in the world's sugar market, and the chief factors influencing the extension of cane cultivation are the general increase in population and the rise in the scale of living, the character of the season, and the prices of such other staples as are grown interchangeably with it. The relative profitability of the conversion of the cane juice into gur and sugar has therefore to be considered in each tract before any decision can be reached as to the possibility of founding a sugar factory there. I am not in a position to discuss this question, in its commercial aspects, but would merely draw attention to the fact that the contest between the two products is very unequal. Gur-making can be conducted by anyone who has the canes growing, accurate

tests regarding ripeness are unnecessary, no capital is required and the practice can be discontinued at any time. Sugar-making is a new enterprise in India, requires large capital and the difficult combination of many growers, can only be instituted after considerable preparation, and cannot be discontinued without serious financial loss.

- (3) Sub-division of the land. These difficulties are emphasised by the opinion, general in sugar-making countries, that for commercial success, the enterprise should be carried on on as large a scale as possible. A large block of land is needed, so compact as to reduce the heavy carting charges to a minimum, and the factory should have control over the fields so that it is kept constantly and evenly supplied with the canes. In the settled parts of the country, the holdings are small, and such sugar-cane as is grown is in scattered plots of small size. It is impossible to alienate the land for an enterprise of this kind, and it is difficult for any control to be exercised by the factory. This is a very important difficulty and practically rules out large areas in the sugarcane tract from the possibility of sugar-making.

- (4) Competition with other crops. The whole question of obtaining lands for sugar-cane-growing will ultimately depend on the relative profitableness of the crops usually grown. This will be referred to later, but it should be stated here that this rivalry varies with the tract, paddy being a serious rival in the irrigated parts of the Peninsula and in parts of Bengal, jute being the main rival in the sugar-cane land of Bengal and cotton in the canal tracts of the Punjab. These crops are not likely to be displaced and the extension of sugar-cane in such areas is therefore unlikely.

Summarising, the extension of sugar-making in India is handicapped by the extremely poor-character of the canes grown, by the unequal competition of gur where it has a steady and satisfactory market, by the relative cost of initiating gur and sugar-making, by the extreme sub-division of the land which renders it impossible to work a factory economically, and by the competition of crops already on

the land and which can be easily and profitably grown. We must turn to places where the price of gur is low, where the land is not fully settled, and where it is possible to introduce a better class of cane varieties.

PROSPECTS IN THE DIFFERENT PROVINCES.

I propose now briefly to pass under review the various tracts in India where sugar-cane is grown, in order to emphasise the fact that each has its own peculiar difficulties, and, incidentally, to see in which directions progress is more likely to be effected.

Madras can grow sugar-cane as well as any average place in the tropics. It, however, requires irrigation, and thus comes into competition with irrigated crops, mainly paddy. The latter crop is perhaps the easiest to grow in Madras, while sugar-cane is one of the most laborious and the most expensive. With present prices of paddy and the possibility of growing more than one crop in the year, it is not likely that sugar-cane will to any large extent replace it, even under favourable conditions. Where, however, large quantities of subterranean water are available, paddy competition is ruled out and the matter is less complicated, in that garden crops (those irrigated from wells) also require a good deal of labour. Ragi (*Eleusine coracana*), groundnut, and cholam (*Andropogon Sorghum*) may be regarded as typical of these. These are the new competitors, and the sugar-cane has a better chance, especially as the individual fields are larger. As an example of successful work in sugar-making in such a tract, I would refer to the sugar factory at Nellikuppam in South Arcot. Here, with a better class of cane introduced by the work of the Samalkota Government farm, with large stores of subterranean water and an easily workable soil, sugar-cane cultivation has made great strides. By suitable advances, the distribution of manure, and the abundant supply of water by powerful engines, it has been found possible to induce the ryots to grow large fields of sugar-cane and bring the canes to the factory. But such areas are rare indeed in Madras, and it has always seemed to me as if a bit of the alluvial plain of the Ganges had been here-inserted between the hard red and stiff clay soils of the Peninsula. The tract is, in fact, composed of the alluvium of two rivers, the Gadilam and Ponnai, and is the centre of the groundnut cultivation in India. From what I know of the conditions prevailing in other parts of the Madras Presidency, I do not consider it likely that any great extension of the sugar-cane cultivation will take place, and the foundation of many sugar factories appears to be less likely still. I have dealt with Madras rather fully because it can grow

such good thick canes, and this fact is constantly laid hold of by those who wish to extend sugar-making in India.

Mysore.—I am not very conversant with the conditions in Mysore, but a good deal of sugar-cane is grown there. It is not a paddy country and the population is comparatively sparse. The rainfall is not great and irrigation is necessary. With the extension of irrigation projects or the discovery of subterranean water supplies, it is not inconceivable that sugar factories may be started, but I would defer to the opinion of the Director of Industries, who has, I believe, made a special study of the question.

Bombay.—Here the problem is again entirely different. The competition of paddy is removed, Excellent cane crops are raised on the rich volcanic soils, and the juice is very rich in sucrose. Yet the area under sugar-cane is insignificant. New Irrigation projects are nearing completion in unoccupied tracts, and it is expected that a large part of these will be planted with sugar-cane. Whether this is utilised for gur or sugar-making, will presumably depend on the prices ruling, but it should not be difficult to obtain large compact blocks if the latter is decided on and the capital is available.

The Central Provinces.—These are on the line of demarcation between the two great sugar-cane tracts in India, and excellent crops of thick canes can be grown in the southern part of the area. The population is sparse, and there is a considerable development taking place in opening up new irrigation works by which considerable areas will be available for sugar-cane-growing. There is indeed reasonable hope that a great deal more sugar-cane will be grown in the near future. But the amount grown is at present extremely small, the price of gur is very high, and the local Agricultural Department do not consider that sugar manufacture can be undertaken on the new land in competition with gur.

Bengal is a great paddy-growing country, but this is chiefly in lowlying land unsuited for sugar-cane. The higher land, with sufficient water to do without irrigation, is, however, fully occupied by jute, which has nothing to fear from competition with sugar-cane. Good thick canes can be grown in many parts but, in spite of this, the varieties are, on the whole, exceedingly poor and primitive. There is undoubtedly room for considerable improvement here, but the Agricultural Department is under special difficulties in Bengal. The population is very dense, and I do not think it likely that large blocks will be available for sugar-cane-growing, even with improved varieties.

Assam.—The unique geographical conditions of

Assam have already been referred to. The population is very sparse and there are large unoccupied areas in Lower Assam on both sides of the Brahmaputra. The unhealthiness of the country has, I believe, improved of late years, and there is some likelihood of the increasing masses of Bengal pushing their way into the Assam valley. An experiment on a large scale has been made by Government, to see if these great unoccupied areas can be utilised for the growing of sugar-cane. The first stage in this experiment has now been reached, and it is evident that, with certain precautions, thick canes can be grown with great ease over large areas of the grass land in Kamrup. There are special difficulties in the way, such as control of surface water, absence of communications, and scarcity of labour, which has to be introduced, but these are to all appearances being successfully overcome, and the prospect is distinctly encouraging. There is a very large amount of land of a nature similar to that on which the farm is placed. The local price of gur is, I believe, high, but the demand is not excessive, and it seems more probable that the limiting factor will be the prices ruling in the great Bengal market.

Behar.—The canes in North Behar are the thin indigenous ones common in North India, although there are some indications that selected thick canes may be grown with advantage. Behar is, in fact to some extent a transitional region between the great sugar-cane tract in North India and the more tropical area of Bengal and Assam. There are a number of sugar-cane factories working, and these, I believe are, in the main, successful. I am led to think that this success is largely due to the fact that the country is one in which the European planter has worked for many years. He has capital, a crop is needed to replace indigo, the people have long been accustomed to work with him and grow the crops for his factories; he has a certain amount of control over the crops grown and not infrequently a certain amount of land is attached to the factory to form a basis for cultivation. The price of gur, although rather high at present, is, I believe, as low as anywhere in India, so that, from the contiguous part of the United Provinces, it is sent as far as the Central Provinces and the Punjab. The pressing need in Behar is, to my mind, the suitable location of a first class sugar station where varietal and other experiments can be instituted with a suitable staff for combined work with the planters. I am told that the local agriculture leaves much to be desired and the canes certainly need replacing by better varieties.

United Provinces and Punjab.—The special conditions in Behar and Assam are absent further north-west, and the prospects become increasingly less satisfactory. The canes grown are excessively

thin and fibrous, the yield per acre is small, and the percentage of sucrose in the juice is often low. This would, further-more, greatly enlarge the area required for an up-to-date factory, with an increase in the cost of cartage. The fields are small and scattered and the cultivators are unaccustomed to sell their crops to a central factory. I do not think that there is much prospect of instituting sugar factories in this region, under present conditions.

WORK IN PROGRESS.

A great deal of work is being carried out on this crop by different Agricultural Departments, but this is scattered and deals with purely local problems. Two experts have been entertained by the Government of India, both of whom are located in provinces and under the local authorities. A Sugar Engineer is engaged in the United Provinces and a Sugar-cane Expert in Madras. With the work of the former I am not acquainted, and I propose here only to deal with the latter, in that I consider that the fundamental problem before India is the improvement of the class of canes grown. This is the problem for the solution of which the Cane-breeding Station has been started at Coimbatore. The main line of work is to replace the local North Indian canes by seedling canes and this, unfortunately, cannot be done in North India because the sugar-cane does not flower there. Attempts are being made to obtain new varieties by crossing thin indigenous canes with thick tropical ones, thus combining useful characters of the two classes. Hardy, moderately thin, rich canes are aimed at which will grow in North India to maturity and be able to withstand the local indifferent treatment at the hands of the ryot. That such an ideal is not unattainable is shown, in the first place, in that crosses have been obtained, although not at present in sufficient quantity or sufficiently studied for distribution, and secondly, because a trail of such a cross has been rendered possible by work in Java. A seedling cane raised there under the No. Java 36 was obtained in Madras and forwarded for trial by the Sugar-cane Expert to Shahjahanpur. It was obtained in Java by crossing the local Chunnee of Shahjahanpur with the rich Cheribon of Java. It has been tested now for some years at the Shahjahanpur farm by Mr. Clarke, and the latest accounts have been very favourable, in that last year all the available sets (some nine lakhs in number) were eagerly taken up by the cultivators. Another variety was introduced by the advice of the Sugar-cane Expert into the Partabgarh farm, and it has rapidly extended until, in the present year, some hundred acres are under it near that place. These two cases are given as a sample of the work which it is intended to carry out when the new varieties being evolved

at Coimbatore are ready for distribution. Altogether some 130,000 cane seedlings have been raised at the Cane-breeding Station, and it is confidently anticipated that, from among these, and those still being obtained, it will be possible to allocate suitable seedlings of every part of India. It has been estimated that the results of the introduction of new and better canes into Madras some years ago by the Samalkota Sugar Station have culminated in a gain of Rs. 25 per acre, totalling Rs. 25 lakhs a year. If the improvement in North India reaches the modest sum of Rs. 5 per acre, it will mean ten crores a year in the ryots' pockets.

It is perhaps needless to point out that if such an improvement can be brought about, the question of sugar-making in India will enter on an entirely new phase. The price of sugar would be regulated all over the country, and possibly considerably reduced by the greater yields obtainable, and there would be a surplus available with more suitable cane varieties for the flotation of sugar-making concerns. But the whole question has its complications, and I do not think that useful results can be obtained with certainty, unless a large view is maintained and the work is properly organized.

FOUNDING OF A SUGAR DEPARTMENT FOR INDIA.

For this purpose I would suggest the formation of a small Sugar Department for India, to be placed directly under the Agricultural Adviser to the Government of India. I would indicate some of its objects in the following manner, but it is inevitable that the relative importance of the different line of work would only be clearly understood as progress could be reported :—

- (1) The collection into one office of the scattered information recorded regarding the character of the sugar-cane tracts in India, the varieties grown, the methods of cultivation and of making the finished product.
- (2) The collection of similar information regarding all previous attempts at founding sugar factories, with the reasons for their discontinuation.

Much of this information (under 1 and 2) is now to be found in the files of various Secretariat and other officers in the provinces, but it is not available and it is desirable to get it together, collate it, and, doubtless in some cases to publish it in book form or otherwise to serve as a basis for future work.

- (3) A continuation of the work on improving the class of canes growing in different parts of the country.
- (4) An organized investigation into the local practices of gur-making throughout the

country, with the object of introducing improvements according to the local conditions.

- (5) A special study of the possibility of starting a sugar-making industry in the various tracts where sugar-cane is grown.

For such a Department to be effective I would suggest the attachment of the following experts :—

- (1) A Sugar factory Expert. He should be thoroughly acquainted with the conditions in India as regards factory work, labour difficulties, general cultivation and the use of by-products. It would be an advantage if he had a working knowledge of the factories and plantations in Java, where the conditions are somewhat similar to those in India.
- (2) An Engineer, for the study of existing installations and the preparation of new models and combinations for gur and sugar-making.
- (3) A Chemist for the study of the cane juice and fibre, to conduct ripening tests and manurial experiments, and to assist in the factory work.
- (4) An Agriculturist, whose main duty would be to study the local conditions of soil and climate as affecting the need of irrigation and drainage, the proper times for planting and reaping and the relative period of growth in different tracts.
- (5) A Botanist, for the study of the numerous articles existing, the transference of varieties from place to place and the raising of new seedling canes for each tract.

Such a Department would, at the outset, be largely engaged in collecting material already existing in the country, so as to gain experience as to the proper lines for work. It should therefore be in close touch, consultatively, with the Provincial Departments of Agriculture interested in the crop and should be prepared to assist and further any work now being carried on by advice or in any other way. Where local effort is considered insufficient it should inaugurate installations or experiments on its own initiative, but I would specially desire that local efforts should be encouraged, because the officers on the spot will of necessity have the most reliable first hand information as to the conditions and possibilities of their tract. The work at present being conducted on sugar and the sugar-cane is scattered and, for the best results to be obtained, I feel sure that it needs to be organized under one hand.

TRAVANCORE.

HOW TO EXTEND THE AREA.

Dr. N. Kunjan Pillay, M.A., B.Sc., P.H.D., Director of Agriculture writes as follows :—

Travancore is not a large sugar-cane-growing country. Sugar-cane is now cultivated only on the lands lying by the sides of some of the rivers, and the total area may not exceed 10,000 acres. But there are facilities for the extension of this cultivation. Some of the wet lands in North Travancore and the low lands lying scattered among the hills on the Eastern portion of the country can profitably be brought under sugar-cane, and arrangements are being made for extending the crop to these areas. In the north more than 50 persons have started sugar-cane cultivation under instructions from the Agricultural Department, and the successes that they are meeting with will surely induce many more to follow in their footsteps. In the hilly district also several persons have of late begun sugar-cane cultivation, and this year a joint-stock company has got registered 1,000 acres, the major portion of which is going to be put under sugar-cane. The increase in the price of sugar brought about by the war is opening the eyes of Travancore people to the profits that await them if they only take to sugar-cane cultivation, and as a result of the present activities one can look forward to an appreciable increase in the area under sugar-cane in the near future. The Agricultural Department is helping the cultivators by giving them instructions and advice and by supplying them with sets of good varieties of canes.

HOW TO INCREASE THE YIELD.

The present average yield of jaggery in Travancore will hardly be more than two tons per acre. This low yield is due to the defective methods of cultivation, particularly insufficient manuring. The manure that is commonly used for sugar-cane, if anything is used at all, is wood ash. The maximum quantity that is applied is not more than 6,000 lb. per acre. A good many cultivators use considerably less than this quantity, while not a few completely dispense with the use of manures. With a view to demonstrate the possibility of increasing the yield of jaggery by the use of proper manures the Agricultural Department carried out some experiments during the last two years. The experiments were conducted on one acre plots and the results shown below can therefore be considered reliable.

		Quantity applied per acre	Yield of jaggery per acre
1915—1.	Wood ash ...	6,000 lb.	5,520 lb.
	{ Wood ash ...	3,000 ..	7,440 ..
2.	{ Oil cake ...	1,800 ..	
	{ Fish refuse ...	600 ..	

1916—1.	Wood ash ...	6,000 ..	6,160 ..
2.	{ Wood ash ...	{ 3,000 ..	{ 7,700 ..
	{ Oil cake ...	{ 1,800 ..	
	{ Fish refuse ...	{ 600 ..	

The ash used contained about 1.5 per cent of potash and 0.75 per cent of phosphoric acid. The oilcake used was that of *Hydnocarpus Wightiana* and contained 1.5 per cent of potash, 1.2 per cent of phosphoric acid and 4 per cent of nitrogen, and fish refuse contained 5 per cent of nitrogen and 4 per cent of phosphoric acid. Thus the ash plot received about 90 lb. of potash and 45 lb. of phosphoric acid, while the other plot received 92 lb. of potash, 67 lb. of phosphoric acid and 102 lbs. of nitrogen. It may probably be necessary to vary the composition of the mixture which can only be done after further experiments. The two experiments described prove clearly the advantages of the mixture over ash. The increase in the yield of jaggery was in the one case 1,920 lb. and in the other 1,540 lb. or on an average 1,730 lb. At the present market price of jaggery the value of 1,730 lb. is about Rs. 150, and the difference in the price of the manures used was only Rs. 25, the mixture costing Rs. 55 and ash Rs. 30.

It is clear from what has been stated above that by the use of proper manures an acre of sugar-cane will yield 3 to 3½ tons of jaggery. The average yield at present in Travancore, as already stated, is not more than 2 tons per acre. If all the existing 10,000 acres are cultivated with proper manures the total out-turn of jaggery can be increased from 20,000 tons to nearly 35,000 tons. The Agricultural Department is doing all it can to induce the sugar-cane cultivators to use the manure mixture which has produced such striking results. The Department has opened this year a manure depot in an important sugar-cane area, and the cultivators in the neighbourhood have purchased manures for nearly Rs. 1,000 in the course of 2 or 3 months. There would have been a much larger sale if arrangements had been made to sell manures on credit and to realise the price during harvest time. If such a system is introduced and manure depots are opened in other sugar-cane areas also, it is possible to make manures widely popular among sugar-cane cultivators and thereby bring about a substantial increase in the out-turn of jaggery in the country.

MYSORE.

EXPERIMENTAL WORK.

The following are the views of Dr. Leslie Coleman, M.A., PH. D., Director of Agriculture:—

- (a) Testing varieties. The results of the past three years have shown conclusively

that Red Mauritius cane is a higher yielding variety than any of our local canes. This has been corroborated by nearly all the demonstrations held on private lands. Careful tests on the Hebbal farm indicate that we may anticipate an increase of yield of from 15 to 20 per cent by the introduction of this variety.

- (b) Manurial tests. The results of manurial experiments with different quantities of local oilcakes indicate that doses up to two tons of castor cake per acre are very profitable at present prices.
- (c) Spacing tests. Experiments have shown that the present planting distance for sugar-cane (rows 1 ft. to 1½ ft. apart) is too close and that yields at least as good can be obtained by planting twice the distance apart. This is of particular importance in the rapid introduction of new varieties.
- (d) Work on seedling canes. A large number of seedling canes have been tested and some of these are giving distinct promise. The most promising seedlings are those of White Mauritius, Striped Mauritius, and Red Mauritius. Seedlings are being selected for vigour, purity of juice, and high sucrose content. The weakness of Red Mauritius is the impurity of its juice and its comparatively low sucrose content; its strength is its great vigour. Some of the seedlings obtained from it promise to be just as vigorous as the present and to yield a very much richer and purer juice.

ESTABLISHMENT OF NEW FARMS.

Two new experimental farms which will be devoted largely to sugar-cane cultivation have been established within the past two years. One of these is situated under the Marikanave Reservoir where there is an area of about 20,000 acres, 10,000 of which could be devoted profitably to cane. The soil is rather poor and distinctly alkaline, and the work of this farm will have to do with the best means of improving the soil and preventing the increase of alkalinity. The other farm is situated under the new Kannambadi Reservoir where it is anticipated that we shall be able to increase our sugar-cane area by 30,000 acres annually. Here the function of the farm will be largely the testing of varieties, the supply of seed, and the demonstration of improved methods of manuring and cultivation.

On the former of these farms a power mill is being installed.

DEMONSTRATION WORK.

- (a) Introduction of new varieties. This work has, up to the present, been practically confined to Red Mauritius and an unnamed Java cane. We have been distributing cane in small lots from our central farm for several years, but it has been found that this is an extremely wasteful method as a great many of the sets become damaged in transit. A somewhat novel scheme is therefore being developed for the establishment of a large number of supply centres. Sugar-cane sets are supplied from our farms and are delivered to sugar-cane growers free of charge on the understanding that double the number of sets are returned the following year. These are then distributed under the same conditions the following year. By this method a large number of supply centres are being established and a very rapid introduction of improved varieties will result. As soon as tests on our farms reveal other varieties of outstanding merit they will be distributed in the same way.
- (b) Popularisation of the use of oilcakes as manures for sugar-cane. While the best sugar-cane-growing districts of the State use oilcakes in large quantities as a manure for cane, in over half our area the use of oilcakes was practically unknown till the Department took up the work of popularising their use three years ago. The scheme followed is an interesting one. Large quantities of oilcakes (about 100 tons) were purchased by the Department and were given out in lots sufficient for one or two acres in areas where the use of oilcake was rare or unknown. Those receiving the cake agreed to pay the cost at the end of their harvest season when the results of the manuring could be seen. The results were almost without exception favourable and the demand for manure increased. During the first two years the manure was advanced without interest, but during the present year interest at 6 per cent is being charged. As the price of local cakes

had increased greatly and as further more they were being taken up by local sugar-cane growers, the Department got into touch with oil-pressers outside the State in Bombay and Madras Presidencies with the result that we have been able to obtain our supplies at a much lower rate and at the same time have not in any way disturbed the local supplies. During the past year about 300 tons of groundnut and safflower cake, two cakes which have been practically unknown to Mysore sugar-cane-growers and which are much richer than our local cakes, have been distributed. A scheme is being developed for the crushing of the large supplies of oil-seeds (chiefly castor and groundnut) which are now being shipped out of the State. It is proposed to erect a large oil-seed-crushing plant under the control of Department of Industries and Commerce, the Department of Agriculture to take over the distribution and sale of the cake in new areas. The scheme contemplates the production of between 1,000 and 2,000 tons of cake per annum. If the scheme is successful similar plants are certain to be established by private agency, and it may perhaps not be too sanguine to anticipate that within the next ten years we shall find the bulk of the oil-seeds which are now being exported utilised in the State.

AGRICULTURAL EDUCATION.

Agricultural Middle Schools in
Madras.

The Madras Government have issued the following Order No. 844, Revenue (Special) dated 1st May, 1919:—

On a consideration of the recommendations of the Conference on Agricultural education held at Simla in June 1917, and of the Board of Agriculture held at Poona in December 1917, the Government decided to open two agricultural middle schools in the Presidency as an experimental measure and appointed a committee of officers of the Agricultural and Educational departments to formulate detailed proposals for the establishment of these middle schools. The Committee was also requested to consider resolution XIII of the Board of Agriculture, 1917, on the subject of the improvement of rural education based on rural needs in the Presidency.

2. The Committee has now submitted its report on the subject of agricultural middle schools. The Government have read with interest the careful and detailed proposals of the Committee and accept its recommendations, subject to the following remarks:—

(i) The Committee considers that two agricultural masters will be required for each school and that, as only two suitable men are now available only one school can be opened at the outset. The Committee proposes to locate the first school at Taliparamba in North Malabar. The Government fully appreciate the importance of inaugurating these schools under conditions which will give them a fair chance of success and accordingly approve the proposals for the opening of the school at Taliparamba in May 1920. The Government do not however consider that the opening of a single school will furnish sufficient data for the formation of any decided opinion as to the success or failure of the experiment. Moreover the Government have already undertaken to open two schools—one of which was to be in the Tamil country and the other in the Telugu tracts. In order therefore that a full trial may be given to the scheme, they request the Director of Agriculture to submit proposals at a very early date for the opening of two more schools at suitable centres in these tracts. Information should be furnished as to the earliest date when these two schools can be opened. The Governor in Council observes that a

fresh batch of agricultural diplomates will be available in June 1919, and another batch in January 1920, and it should be possible to spare four competent subordinates who, with a further training in pedagogy, can be posted to these two schools.

In view of the delay that has already occurred the Government attach great importance to the opening of the school at Taliparamba in May 1920, and the Director of Agriculture is therefore requested to submit as soon as possible, in consultation with the, Director of Public Instruction, plans and estimates for the buildings required at Taliparamba. The additional land which is needed for the purposes of the school should be selected at once and proposals for its acquisition should be submitted without delay.

(ii) In paragraph 11 of its report the Committee recommends that the candidates to be recruited for appointment as teachers in the agricultural schools should, while undergoing training both at the Agricultural College and subsequently at the training school, be granted a stipend of Rs. 20 per mensem. The Government are unable to accept the Committee's proposal in its entirety. They consider it sufficient to grant the stipend only during the period of training in pedagogy in the training school. No scholarships are at present awarded at the Agricultural College, Coimbatore, and it will be difficult to select students to be teachers at the agricultural schools before they have undergone any training at the agricultural college.

(iii) The Committee's proposal to charge an inclusive fee of Rs. 15 per term per pupil is approved, but as recommended by the Board of Agriculture in resolution XIV (iv), the desirability of making these schools as nearly self-supporting as possible should be steadily kept in view. The Director of Public Instruction is requested to report after some experience has been gained of the working of these schools whether the fees may be enhanced.

(iv) In paragraph 17 of its report the Committee suggests a staff of two agricultural teachers and one non-technical teacher for the school and recommends that the agricultural officers, one of whom will be the head-master, should get a local allowance of Rs. 30 and Rs. 10 per mensem respectively in addition to the pay of their grades in the regular line. A pay of Rs. 50 is proposed for the non-technical teacher. The Government accept the proposals as regards the strength of the staff and the pay of the non-technical teacher but are not convinced of the necessity for the allowance proposed for the agricultural masters. The two agricultural officers selected for the posts of teachers at the school to be opened at Taliparamba should begin their training at the secondary

training school attached to the Teachers' College, Saidapet, in July next. The Government doubt whether both these teachers will be required in the first year of the working of the school when there will be only one class with 20 pupils. The Director of Agriculture is requested to report whether it will not suffice to employ the second agricultural teacher in 1921 when the second year class opens.

The Committee has recommended the appointment of a matron on Rs. 15 per mensem for the school. The Government doubt the necessity for this appointment and would be glad if the Director of Agriculture will, in consultation with the Director of Public Instruction, report what duties are to be entrusted to the matron and whether such an appointment is indispensable at the proposed school.

The head coolie proposed by the Committee should, when appointed, be paid from contingencies.

(v) The recommendations of the Committee in paragraph 19 of its report on the subject of the preparation of the text-books on agriculture and nature study, mathematics and geography are approved. Mr. Wood having since been appointed as Director of Agriculture, the Government doubt whether he will be able to prepare the text-books on agriculture and nature study in addition to his duties as Director. In the event of his being unable to undertake the work, he is requested to report which officer should be entrusted with the preparation of the books.

The Directors of Public Instruction and of Agriculture are requested to report not later than 15th June, 1919, whether the officers whom they may select for the preparation of the text-books should be placed on special duty or whether the work can be undertaken by these officers in addition to their ordinary duties and without detriment to those duties. The suggestion of the Committee for the grant of a remuneration for the compilation of the text-books will be considered on receipt of the report called for.

3. The Committee have not expressed any opinion as to the age and qualification of the candidates seeking admission in the proposed schools. The Director of Agriculture is requested to report on these points.

TOPICS FROM ECONOMIC PERIODICALS.

QUEBEC'S PAPER AND PULP INDUSTRY.

An interesting review of the remarkable growth of the Pulp and Paper industry in Quebec and its prospects of further advancement is given by Mr J. C. Ross in the *Canadian University Magazine*. He mentions that the value of paper and pulp exported from Canada exceeds that of any other of her manufactured goods with the exception of munitions, which is now a thing of the past. From the pitifully small \$122 worth of paper exported 27 years ago, the exports of pulp and paper now exceed \$96,000,000 and the end is not yet. Mr. Ross proceeds:—

The success which has been attained by the pulp and paper industry is not a matter of chance or haphazard effort. For the success of industry three essentials are required namely, abundant water power, large available forest resources, and a plentiful supply of labour. The province of Quebec possesses these to a remarkable degree. Out of the Dominion's total water power, amounting to 18,000,000 h.p. Quebec has 6,000,000, or one-third but only a seventh of this power has been tapped by Engineers. In addition to that the rivers and streams of the Province nearly all flow to the south which carry the products of forest and factory towards the great markets of the United States. In regard to the Forest wealth, over one half of the total pulp resources of Eastern Canada or 300,000,000 cords, are located in this province, while in the matter of labour the French lumberjack is without an equal in the world. Altogether its water power, raw material, labour, shipping facilities, and nearness to a great market, combine to make this province one of the world's great pulp and paper manufacturing centres.

The remarkable growth and expansion of the pulp and paper industry in this province is directly traceable to the far-sighted policy put into force by the Gouin Government. Legislation was passed a decade ago prohibiting the export of pulp wood cut from crown lands, and as a result of this policy American paper manufacturers, who formerly depended on this province for their supply of raw material,

were forced to move their plants to Quebec, and manufacture the pulp wood into paper on this side of the border. At the same time the Government adopted the most progressive measures in regard to conserving the water power of the province and safeguarding the forests by instituting thorough fire protective measures. In addition every possible assistance and encouragement is given to those who desire to go in for re-forestation and the scientific cutting of their timber resources, while the forest Products Laboratories at Mc.Gill continue to do a most useful work of an experimental nature.

To-day, as a result of wise legislation and favourable natural resources Quebec province has over forty pulp and paper mills located within her borders, or almost half of all those operating throughout the Dominion. While the growth of the industry has been most rapid in the last few years it is by no means of a mushroom nature. It has developed throughout the years until to-day, it is almost the most important manufacturing industry.

The United States is becoming more dependant on Canada for her pulp and paper. Quebec has the largest available supply of pulp wood on the continent, the greatest power resources, and as the nearest province to the large consuming centres of the Eastern States, it must continue as the great source of supply. The provincial authorities and the heads of the great paper mills in the province are fully alive to the situation and are prepared to "carry on" to a still greater extent. It is not only to the United States that paper men are looking for the markets; they find that there is a great demand for Canadian paper products in South America, South Africa, Australia and other parts of the world. In order to take care of the export business, the paper manufacturers have formed an Export Association which has for its object the closest possible relations between the manufacturers, thereby securing a standardised product and also greater efficiency in marketing and selling the output.

The pulp and paper industry of the Dominion is one of our great basic industries, and is not dependant upon artificial aids for its maintenance. Within the last few years it has gone upon a staple basis largely through the employment of technically trained men in its mills, through the adoption of conservation policies in regard to the care and cutting of its forests, as well as by the use of the re-forestation, the standardisation of its products, and the adoption of progressive measures of manufacturing and marketing until to-day it is not only the most important exporting industry, but is destined to be the most important of all Quebec's manufacturing industries. The development of the pulp and paper industry in this province is only in its infancy.

INDIAN EXPORTS TO GREECE.

Possible lines of export.

Mr. D. T. Chadwick, I.C.S., Indian Trade Commissioner in London, has furnished this Department with some interesting particulars obtained from a reliable source, on the prospects of India's export trade with Greece. These particulars are summarised below :—

Cotton Yarn and Cloth.—Before the war cotton yarn was imported from India to all the Balkan States, but only in the lower counts from 4—12, the higher counts being found weak and consequently avoided; thus the demand for such higher counts was filled from Italy for 12—14, and from England for higher numbers. Now that Indian spinning mills have greatly improved the qualities of their higher counts, and are in a position to produce 20's and even higher counts, a considerable business may be anticipated. All the yarns exported to the Balkan States is made up in 10 lb. bundles, leareeled, each bundle cased in cardboard backs and wrapped in paper with the number stamped on the outside. There is also a large business transacted with the Balkan States in Extra Hard Twisted Yarn (Crape Yarn). Local spinners, in producing such yarn, from cotton grown in Greece (corresponding in quality to good Indian cotton) use it as a basis for the twist, the square root of the count multiplied by 7 or 8 instead of the $3\frac{1}{2}$ to 4 for water twist. Such hard twisted yarn is sold in Nos. 4 to 20 and higher.

Large quantities of yarn also imported bleached and dyed (blue and red principally).

As far as cotton goods are concerned, the Indian production is unknown in Greece. The class of goods which could be manufactured in India, and which would have a ready sale in Greece, would be cloths, sheetings, Cabots, etc. In view of the shortage of stocks in the Balkan States, a large business is to be foreseen in all lower classes of cotton goods.

Importation has recently commenced from Japan of Cabots and T cloths which have created a fair impression on the market.

Cleaning Waste—(from Cotton yarn).—Would be of great interest.

In all articles mentioned above full assortments of samples would be necessary.

Vegetable Oils.—All these are imported in large quantities (Linseed Oil, crude and boiled), Castor Oil both for medicinal and industrial purposes, other oils for soap manufactures, and would greatly interest Grecian markets.

Oil Seeds.—These would not be of great interest for the Balkan States at present as the oil producing industry (with the exception of olive oil) is still in its infancy.

Spices.—Pepper is imported in considerable quantities and would be of interest, and other spices also.

Indian Coffee.—This is practically unknown, the Brazilian article being exclusively consumed. The Greek Government recently imported a quantity of Indian coffee but it was not generally approved.

Tea.—Both Indian and Ceylon tea are largely consumed in the Balkan States.

Wheat.—At the present moment practically all the wheat consumed in Greece comes from India, but for the time being is a State monopoly.

Other articles, which would be of great interest to all the Balkan States and in which a large trade is transacted, are :

Hessian Cloths and Sacking, in all weights and widths.

Bags for various purposes.

Mineral Oil.—Large quantities are imported of Crude Oil, Lubricating Oil and all other petroleum products, which would be of interest, provided that, when transport conditions resume normal level, prices, in combination with freight, must compare favourably with those of American Oils.

Raw Hides are imported in large quantities to be tanned locally.

Before the war a great part of the merchandise from India for the near East, was carried by Austrian Lloyd steamers and landed at Trieste, thence transhipped to destination by steamers of the same company. Such a procedure, entailing considerable delay and extra expense, was naturally not conducive to the development of business with India. It is hoped that arrangements will be made permitting retranshipment of such goods at Port said in the future.

ECONOMIC NOTES.

AGRICULTURE.

Plantain Stalks as Fodder for Cattle in Famine Years.

The Bombay Department of Agriculture has issued the following leaflet (No. 1 of 1919):—

In years when fodder is abundant, a considerable amount of even good fodder, such as *jowar* stalks or wheat chaff, has no value to cultivators. But in years of scarcity, anything that will even barely maintain the life of cattle, becomes invaluable. Spear grass from the Mallad tract, which would not even be smelt by the cattle of the tract where wheat is usually grown, has now become the chief source of fodder in that tract. Leaves and pods of many varieties of trees are being used as fodder by cultivators to save their cattle. The use of prickly pear is being demonstrated as fodder in places where it is available. In times of scarcity in fact, such as the present, many things have to be used which would normally not be thought of. And the only question at present is to find material that is available and will keep cattle alive and in health.

Among the several kinds of fodders hitherto known in this part of India, in famine time, no mention seems to have been made of plantain stems, though its leaves, which are employed as dining plates, are sometimes given to cattle after their use. However for this purpose our experience this year has shown that plantain stems, their leaves, and even the roots, have been regularly fed to cattle in certain villages of Belgaum District as famine fodder without any injury to the health of the cattle. The way in which the feed is prepared from the stem, and the quantity given to work and other cattle, and its good or bad effects on the cattle fed, is indicated below for the information of such cultivators as may have plantain gardens of their own, or be able to get stems from other gardens:—

The stems of plantains, after the bunches are removed, are cut about six inches from the ground and are usually thrown in a pit without being used for anything. Instead of this they should be cut close to the ground, or dug out to a depth of about six inches below the ground. All dry leaves or the dry sheaths should be removed. The remaining

green stem, with the sheaths and its core should be cut into small slices by a sharp sickle or a *koyata*. This is easily done by cutting the stem crosswise. The pieces thus cut, can immediately be fed to cattle without any addition of salt or mixtures of other foods to the slices.

Buffaloes eat the slices very readily. Some cows and bullocks do not like them at first. Experiments conducted on Dharwar and Gokak farms, in feeding plantain stems to farm bullocks for one month, prove, that one meal during day time can safely be given to work cattle. The highest quantity given for each work bullock was up to twenty pounds per day. These bullocks received, in the evening, the usual quantity of kadbi (half the daily quantity) and the concentrated food, and the meal during the day time consisted entirely of plantain stems. The condition of the cattle was tested by actual weighments before and after the experiments of feeding plantain stems. There was not the slightest loss in weight.

It is a general belief among cultivators, that cattle fed on plantain stems may purge, and consequently lose condition. Actual experiments have proved that such is not the case. The dung of cattle, fed up to 35 pounds of stems daily, was as hard as the dung of the cattle fed on kadbi and chaff alone. Thus there is not the slightest risk in feeding plantain stems, to cattle in general and especially to buffaloes, cows, and young stock. The knowledge of these facts will be very useful in villages where there are plantain gardens, but the stems are now wasted. If all the stems are properly cut and fed to the cattle, it will be a great addition to the present stock of fodder, which would help to save a large number of cattle in a critical time like the present.

CULTIVATION OF MAIZE.

(*Zea mays*.)

The Mysore Gardens Department has issued the following leaflet (No. 3 of 1919):—

INTRODUCTION.

Maize is supposed to be indigenous to South America whence it was imported into Europe and later on into India. It is one of the larger and more important cereals of the world. Excepting rice, it is more widely cultivated than any other cereal. This plant furnishes the food grain of a great portion of the American continent. The crop is raised by seeds, and it is an irrigated one. The plant grows to a

height ranging from 4 to 12 feet according to variety. This crop requires a deep, moist and fertile soil manured richly.

PREPARATORY CULTIVATION.

The land should be brought into a fine tilth by ploughing or digging. About 25 cartloads of well rotted farmyard manure should then be worked into the soil.

SOWING.

The seeds should be sown in furrows 1" deep and 6" apart, the distance from furrow to furrow being 2 feet. The seed rate is about 10 lbs. per acre.

IRRIGATION.

The crop should be irrigated once a week in the absence of rains. Maize can be grown under sewage also.

AFTER CULTIVATION.

The plants should be earthed up and the crop should be weeded and stirred when the plants are 4" high. This operation should be repeated twice, *i.e.*, when the plants have attained a height of one foot, and two and a half feet respectively. If earthing up is not done, the plants will lodge on the ground. The plants should be thinned gradually so as to leave a distance of 18" from plant to plant. All side shoots should be removed as often as they appear. This operation is necessary to prevent food materials required for cob formation from being taken away by the side shoots.

YIELD.

The crop is usually ready for harvest in two to three and a half months from the time of sowing, according to the variety. About 10,000 to 15,000 cobs or 2,500 to 3,000 lbs. of grain per acre can easily be obtained.

PROFIT.

The cost of cultivating an acre of maize amounts to about Rs. 60 and the gross income will be about Rs. 90.

OTHER USES.

The cobs may be used as a vegetable if gathered while tender. If maize is planted for fodder, about 40 lbs. of seeds per acre must be sown thickly mixed with a leguminous crop such as soybeans, cow peas, etc.

CONCLUSION.

The varieties known as *Manila Moro* and '*Hickory King*' are recommended for commercial gardening. For home gardening the variety known as '*American Sugar Corn*' is the best.

SERICULTURE.

Silkworm Rearing in Indo-China.

Monsieur A. Gachon, Inspector of the Agricultural and Commercial Services in Indo-China, contributes to the *Congres d' Agriculture Coloniale Government General de l' Indochine* (Hanoi Series, No. 7), a lengthy article on the silk industry of Indo-China. The following summary of the article appears in the November issue of the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, issued by the International Institute of Agriculture, Rome:—

The cultivation of mulberry and silkworm rearing has been practised in Indo-China since remote times and, in nearly all the countries of the Union, silkworm rearing might be greatly and rapidly developed. Many circumstances have contributed to making prosperous this essentially agricultural and home industry. The mulberry grows easily and develops well. The worms may be reared throughout the year in some districts and during the last eight months in the least favourable ones. Abundant cheap labour and the free time left by the small variety of crops grown are very important factors in the possible development of silkworm rearing.

France buys annually in the Far East raw silk to the value of nearly £8,000,000, manufactures it and exports most of it as silk materials throughout the world. Indo-China might supply France very largely, as is shown by the quotations, with material equal to the best products of Canton, of raw silk and waste prepared by European methods chiefly in Tonkin and in Annam. These goods are already appearing on the French market. These considerations led the Government of Indo-China to encourage the improvement and development of the silkworm industry by all the means in its power, in order to export the produce to France.

The author after describing the cultivation of the mulberry and silkworm rearing in Indo-China gives an account of the work done in the colony especially by the Administration, to develop silkworm rearing. In 1905 the Administration appointed a silkworm egg specialist and founded an establishment at Phulang-Thuong for the production of eggs selected by the Pasteur method. At the same time pamphlets of a kind to be understood by the natives were

drawn up in French, Quoc-ngu, and Chinese. They gave simple, rational and practical methods for improving silkworm rearing, spinning and the preparation of waste, and were widely distributed in the silk centres and in all the provinces where they might have a useful effect.

Model and experimental silkworm nurseries and two egg-production establishments, one at Bach-hat (near Vietri) and one at Kien-an (near Haiphong), were opened. The working of the egg-production centre of Phulang-Thuong, the oldest, best equipped and largest of the colony, was assured from 1907 to the end of 1916 by a commercial company enrolled by the Administration and prepared to supply 3,000,000 layings. The establishment was taken under direct control on January 1, 1917, and its production exceeded 3,500,000 layings in 1917. The Bach-hat egg-production establishment, the second in importance, has been managed by the Administration since its foundation in 1914. It distributed free of charge 600,000 layings in 1914, 1,000,000 in 1915, 1,650,000 in 1916, and about the same number in 1917. The Kien-an egg-production centre was only established in 1916 and its production has reached 110,000 layings; in 1917 it exceeded 250,000. When the Phulang-Thuong establishment was opened, a silkworm breeding research station was attached to it to study the introduction of foreign species, crossings, etc.

Of recent years Cochin-China, Annam, Cambodia, following the methods used in Tonkin, have opened establishments for egg selection by the Pasteur method, model and experimental silkworm nurseries and plantations, as well as workshops for studying improved methods of silk spinning, the preparation of waste, and weaving for the European market. Since about ten years the Administration, especially in Tonkin, has made great sacrifices in order to develop the silkworm industry.

The silk spinning basins have been altered and perfected giving as much consideration as possible to the native methods and customs. Many basins have been supplied free of cost to spinners who have thus been enabled to produce raw silk saleable in France either as they arrive or after a very simple system of re-reeling and re-boiling. The waste and by-products of the spinning industry prepared by a rational, more profitable method than formerly, may now easily be exported to France. A premium of \$0.80 per kg. (about 9ft. per lb.) was instituted in 1907 and continued till the end of 1915 in favour of steam spun or reeled raw silk exported to France, in order to help and encourage those engaged in the trade. There are three steam spinning mills in Tonkin: (1) that opened in 1906 at Nam-dinh, the

most important, with 100 basins; (2) that of Thai-binh, opened in 1909, with 40 basins; (3) that of Kien-an, opened in 1915, with 60 basins. A fourth is to be built during 1918 at Vietri. Large numbers of improved direct basins, spinning for export have been set up in the provinces of Nam-dinh, Taininh, Ninh-binh, Hadong, and at Bach-hat. Certain mills, better equipped than others, have boilers for heating the water of the basins by steam, a more regular method than by wood, but the reeling apparatus is always on the model of that recommended by the Administration.

The European silk industry has been centred in Annam in the Binh-dinh, at Phuphong, near Quinbone, since 1903. A French company owns there a spinning mill with 100 spinning basins, a silk-twisting machine and a large weaving machine. All the products, raw silk, waste, and materials (crepe, crepon, pongee, etc.) are exported and sold in France.

The Annam Protectorate has installed, in various silkworm rearing centres, small egg-producing establishments managed by native agents of the local Agricultural and Commercial Services under the direction and supervision of French officials of the Service. As in Tonkin these small establishments work in co-operation with the model silkworm nurseries, or obtain their supplies from rearers who have specialised in egg-production.

In Cochin-China an Annamite company for spinning and weaving silk by European methods was founded at the beginning of 1914. A factory was built for receiving the material which has not yet been delivered, owing to present conditions. The Orphanage of the Sisters of Culao-Gieng has a hand-weaving factory and a factory for crepons, pongees, figured silk and silk embroideries for the European markets. In spite of somewhat primitive equipment the products of this industry are very satisfactory and find a ready sale. The local body of the Agricultural and Commercial Services has two egg-production centres, one at Saigon and one at Tan-Chau, supplied by model silkworm nurseries belonging to the Administration and expert rearsers. Many model nurseries and mulberry plantations, each having a small factory for silk spinning and weaving by improved native methods, have been established in silkworm rearing centres. Each year the Agricultural and Commercial Services of Cochin-China distribute gratis an average of one million selected layings. Cambodia has an egg-production establishment supplied with cocoons from model nurseries or produced in chosen centres by careful breeders. The selected eggs are distributed free of charge to all breeders who apply for them,

an annual average of one million layings being distributed among the silkworm districts of Cambodia.

A silk worm-rearing research station has been opened at Phompenh and has already given interesting results. Varieties of native worms have been most carefully selected and have given very strong white and yellow types of very pure colour. The experimental spinning and weaving factory has attracted the attention of the French and Cambodian populations, and a company was recently formed to start a steam silk spinning factory with 100 basins and, later, a factory for machine weaving.

The reduction of the taxes on mulberry plantations made in 1905 by Governor-General Beau has given good results but less far-reaching than was expected, by reason of the native communal organization and the payment of taxes by villages. The conferment of honorary rewards, of small grants and prizes given in competition, would appear to have more opportunity of starting a movement for the extension of mulberry plantations and the improvement of silkworm rearing methods and the silk export industry.

For several years the "Musée agricole et commerciale" of Hanoi, belonging to the Agricultural and Commercial Services of Tonkin, has given professional instruction to numerous Annamites. A model silkworm nursery and mulberry plantation, a set of direct basins and several improved weaving looms, make it possible to follow the full cycle of the silk industry. This instruction has proved most useful, and many Annamites owe new means of earning to it. It has made possible small home industries which need no help from the Administration. Although the silk industry workrooms of the Hanoi Museum have had to make room for other trades, equally interesting as home industries, the instructors continue their work in the province and also in other countries of the Indo-Chinese Union (Cambodia, Cochin-China, Annam.)

All Indo-China is wonderfully well suited to the development of the silk industry. A large market for the products is assured as raw silk materials have taken first place among the exports of the Far East to France, and woven silk materials are the most important exports of France. The export of raw and woven silk to France did not exist about ten years ago; now its value exceeds 1 million francs (£39,649) for Tonkin and $\frac{1}{2}$ million for Annam. Some Chinese merchants export native silk and silk waste to Hong-Kong, Malaya and Siam. This trade has decreased greatly in Tonkin and Annam, but is still flourishing in Cambodia and Cochin-China. It is to be hoped that it may be completely replaced by an industry exporting all its products to France.

INDUSTRIES AND COMMERCE.

Sisal and Henequen in Jamaica.

The following article by Wm. Harris, F. L. S., Government Botanist and Superintendent of Public Gardens, has been recently published by the Jamaica Department of Agriculture as a leaflet, and is here reproduced for the benefit of readers of this *Journal*. Social cultivation has been advised to be a profitable industry in Mysore by Mr. Chatterton:—

Sisal. (*Agave sisalana*).—Native of Central America and Mexico where it is cultivated to a small extent for fibre for domestic use, but not for export. Sisal is more widely distributed than any other fibre-producing *Agave* and is cultivated commercially in the Bahamas, Jamaica, Turks and Caicos Islands, Hawaii, Java, East Africa, Bengal, and Indo-China.

Plant.—The leaves are dark green or slightly glaucous, 40 to 60 per plant, each 3 to 4½ ft. long, 3 to 4½ inches wide at the middle, ¾ to 1½ inches thick at the narrow part near the base, with a slender dark brown terminal spine about one inch long. Usually there are no spines along the margins of the leaves, but sometimes the edges are sparsely furnished with small spines pointing downwards.

It produces a flower-stalk or pole 12 to 25 feet high with slender branches curving upwards, yellowish-green flowers about 2½ inches long which are succeeded by young plants known as "bulbils," never by seed capsules. Bulbils are ready for gathering about five months after the pole produces flowers. The life of the plant is from five to ten years; the appearance of the flowering pole indicates the last stage of its life-history and it then dies.

Propagation.—As Sisal never produces seed, the "bulbils," or adventitious buds from the flowering pole, or "suckers" from the base of the plant are used for propagating the species. It has recently been pointed out that the suckers are apt to pole at the same time as the mother plant and it is, therefore, recommended that "bulbils" only be used for propagating purposes. A single pole will produce from one thousand to four thousand bulbils.

Nursery.—As soon as the "bulbils" drop off the flowering poles they should be collected and planted at distances of six to nine inches apart in nursery beds. The nurseries should be established

at convenient centres in the field where the plantation is to be formed as the cost of transport of plants for any considerable distance, when they are twelve to eighteen months old, is a somewhat heavy item of expense. The nursery beds should be kept weeded and clean until the young plants are big enough to go out in permanent positions in the field.

Soil.—It has been asserted that Sisal will grow and flourish anywhere, no matter how sandy, sterile, or impoverished the soil may be, but practical experience does not confirm this. Wet lands or rich lands are not suitable, for although the plants may grow quickly they are short-lived and the fibre from the leaves is poor in quantity and in quality.

In 1899 a plantation of Sisal was laid out at Hope Gardens in a soil of gravelly alluvium; the plant made excellent growth but began to "pole" when three years old just when the first crop of leaves should have been ready for cutting.

Dry limestone districts near the coast, with broken rocky surface and numerous crevices where humus and red earth have accumulated are suitable situations.

The plant delights in light and air and should be grown where it has full exposure.

In the coastal regions there are often large areas of fairly level or undulating land on the limestone formation where the underlying rock is broken and porous and where little, if anything of value, is now grown, and such lands, where easily accessible and of considerable extent should be planted with Sisal.

Small plantations in isolated situations, unless close to a factory, cannot pay and are not recommended.

Distances in Planting.—In very poor soils such as those of the savannahs of southern Manchester and St. Elizabeth where growth is not vigorous, we are finding that distances of 5 feet by 6 feet allow sufficient space for the plants to develop, and at these distances there are 1,452 plants to the acre. This, however, may be considered the minimum, and the fibre which will be obtained from the leaves of these plants will probably be short in length.

In the average Sisal soils of Jamaica distances of 6 feet by 6 feet or at the rate of 1,210 plants to the acre will be found to be good practice but in richer woodland soils it would be advisable to plant at wider distances, say, 6 feet by 8 feet, or at the rate of 908 plants to the acre.

Planting.—Having decided on the distances and lined out the field, holes just large enough to receive the bases of the young plants should be prepared by pickaxe, hoe, or digger. Then the young plants should be taken from the nursery as required, *all roots should be carefully pared off close to the*

stem, and each should be firmly planted in its hole, not deep enough to keep it in an upright position.

After-cultivation.—Clean cultivation is not absolutely necessary but it is well to keep down the grass and weeds along the rows of young plants and in most places two weedings a year will be ample. The growth of bush through the plantation should on no account be allowed.

In compact, sterile soil it has been found that loosening the surface round each plant, and mulching with the grass from between the rows has had a most beneficial effect, but there are few situations where this will be necessary.

Harvesting the Leaves.—The leaves are at first vertical in the centre of the plant and with the development of younger ones they gradually incline until they assume a horizontal position. The colour, too, gradually changes from a light green to a dark green. The exact age for cutting will, of course, depend on the rate of growth, and this again will depend on the fertility of the soil and rainfall. The average, however, may be put down at three to three and a half years after planting out in the field. There is no special season for cutting the leaves as they are maturing all the time, and it is generally understood that leaves are mature when they have reached an angle of 45 to 60 degrees with the groundlevel.

One grower here cuts leaves that are almost vertical and asserts that by so doing he encourages the rapid growth of the younger leaves and in this way is able to reap one leaf per plant each week.

But if the anatomy of the Sisal leaf is studied, it will be found that the *sclerenchyma* (derived from the Greek, meaning hard, stiff, in allusion to the comparatively hard, and thickened cell-walls) which is the source of the commercial fibre, is composed of cells.

Sclerenchyma is only one of several substances that are found in the leaf, but all are composed of variously-shaped, correlative and inter-dependent cells. These cells require time to grow and mature, and if the leaf is cut before the cells are mature it stands to reason that the fibre obtained will be deficient in quantity and in quality. Every vegetable product, such as root, fruit, wood, etc., requires a certain period of time to arrive at maturity, and the fibre of the Sisal leaf is no exception to this rule. The fact that the Sisal leaf has attained its maximum dimensions does not necessarily indicate that it has arrived at maturity; sugar-canes, for example, are fully grown long before they are considered to be fit for the mill.

On the other hand, when leaves are ripe they should be cut or they will begin to deteriorate and over-ripe leaves will yield a poor grade of fibre.

Fibre should be at least three feet long, and plants are ready for cutting when mature leaves of at least this length are to be obtained.

The first cutting will include all the lower leaves, many of which will be dead, and others too short or otherwise unsuitable for decorticating but they should be removed close to the trunk; this is important, so that the butt end of the leaves shall be smooth and even, and watchful care will be necessary to prevent the cutters taking off immature leaves the fibre from which would materially depreciate the market value of the crop. When the leaves are cut they should be made up into bundles of convenient bulk, say 25 in each bundle, and removed to the cleaning machinery. As all operations are calculated and paid for at the rate of so much per thousand leaves, it will simplify counting if each bundle contains a fixed number.

Yield.—In the Caicos Islands 15 leaves per plant per annum is said to be the average yield during the life of a plant, each leaf weighing from $\frac{3}{4}$ lb to 1 lb. Elsewhere the average number of leaves produced by the plants before they produce their poles is 140 to 180 weighing $1\frac{1}{2}$ lb, and this agrees fairly well with our experience in Jamaica.

Taking the weight of each leaf at $1\frac{1}{4}$ lb and a minimum of $3\frac{1}{2}$ per cent of extracted fibre, 1,000 leaves should give about 43 lbs of dry fibre in average soils.

Each acre of 1,452 plants (at 6 feet by 5 feet) in poor soil, yielding, say, 40 leaves per plant each year, calculating the weight at 1 lb per green leaf and the extraction of dry fibre at 3 per cent, should produce 1,742 lbs. of commercial fibre. The yield of fibre from plants at 6 feet by 6 feet in suitable soils in Jamaica may fairly confidently be put at $\frac{3}{4}$ to 1 ton per acre per annum, and the life of such plants after reaching the cutting stage should be 3 years; therefore, each acre of Sisal should yield from $2\frac{1}{2}$ to 3 tons of commercial fibre before replanting becomes necessary.

It is highly important that the fibre should be extracted from the leaves not more than forty-eight hours after they are harvested. When exposed to the sun and air after being cut, they lose their natural moisture, which is useful in cleaning them, and the juices set up a fermentation which, if long continued, will seriously injure the quality of the fibre.

Cutting the Young Pole.—It is recommended that as soon as the flowering pole appears it should be cut down, unless bulbils are desired, for if it is allowed to grow the upper leaves surrounding the stem will not develop and yield fibre.

Drying and Baling.—The fibre after it comes from the machine is hung on lines in the open air

for several hours, but rapid drying is to be avoided. During the bleaching process the greenish tinge disappears.

Grading.—If the Sisal is to obtain a good name in the market it must be properly graded. Buyers, especially in large markets, naturally desire to be certain of what they are purchasing, and this can only be secured by confidence in accurate grading. Having trust in their exporters, buyers will, on the strength of that confidence, be able to sell the fibre at good prices even before it reaches the market. On the other hand, a dealer distrusting his consignment is put to the trouble of unpacking, grading, and re-packing the fibre and this additional handling increases the charges to be paid by the exporter and does not add to the value of the consignment. It is of vital importance for ultimate and permanent success to insist on absolute honesty and integrity in grading the fibre.

Baling.—When the fibre is dried and has been carefully graded it is made up into bales of about 400 lbs. weight and 20 to 22 cubic feet measurement, and is then ready for shipment.

HENEQUEN (*Agave fourcroydes*, is a native of Mexico. It is the only species cultivated in Yucatan for the production of fibre for export. According to Professor Trelease, in Yucatan, Cuba, and elsewhere in Spanish America, the name "Henequen" (pronounced hen-e-ken) is used to designate the plant and also the fibre. In the markets of America and Europe the fibre is usually called 'Sisal.' It constitutes more than 90 per cent of the Sisal of commerce.

Plant.—It produces a trunk often 4 to 6 feet high; the leaves, 80 to 100 per plant are $4\frac{1}{2}$ to 5 feet long, straight and rigid, light bluish-green, 4 to 6 inches wide at the middle, uniformly spiny along the margins, the spines blackish, straight or gently curved upwards, with a terminal spine about $1\frac{1}{2}$ inches long. The flower-stalk or pole is 12 to 25 feet high, with stout, horizontal branches, bearing at the slightly upcurved ends dense clusters of yellowish-green flowers about $2\frac{1}{2}$ inches long, succeeded usually by bulbils in Jamaica, but elsewhere seed-capsules are also produced.

Conditions of Growth.—Whilst the *Sisal* is suited for soils of the limestone formation, the *Henequen*, although naturally a limestone plant appears to be better adapted in Jamaica for gravelly alluvium, and in such situations it lives from 10 to 14 years, or longer, before poling.

Propagation, etc.—The methods of propagation, planting, cultivation, etc., recommended for *Sisal* apply also to *Henequen*, but as it is a larger growing plant than *Sisal* it should be planted at distances of

at least 7' 6" by 7' 6" apart in alternating rows, or about 774 plants to the acre.

Yield and Value.—*Henequen* is reputed to yield up to 5 per cent of clean, dry fibre, and although *Sisal* usually fetches a higher price in the markets the yield of fibre is lower. It is considered, therefore, that where *Henequen* succeeds it is the more profitable source of fibre of the two species mentioned.

Although the fibre plants have long been known in Jamaica, and a good deal of information has been published from time to time giving advice as to the best methods of planting, etc., it is only within recent years that their cultivation has been taken up seriously. We probably have much to learn to secure the best results under our local conditions; it is not advisable to blindly follow methods that are adopted in other countries where different conditions obtain and we can only hope to gain exact knowledge by experience.

MANUFACTURES AND INDUSTRIES OF BIHAR AND ORISSA.

The following particulars regarding manufactures and industries in each Division of the Province of Bihar and Orissa are taken from the Administration Report of that Province for 1917-18 :—

PATNA DIVISION.

The mica industry in Gaya enjoyed a prosperous year, and several new mines were started in the district. The mines at Sabaiya Tanr were bought by Government to secure for war purposes the high class mica obtained from them. There was a good demand for lac, and the *tasar* industry of Kadirganj in the Nawada sub-division in Gaya did well; similarly weavers at Bihar profited from the decline in the supply of foreign cloths, and their co-operative societies helped them to make the most of their opportunity. On the other hand, Messrs. Mukharji and Company's factory at Arrah was unable to work up to its full capacity, and the mills and iron foundries at Dinapur in Patna were closed down owing to the shortage of coal. The export of raw sugar in the Jahanabad sub-division was hampered by the difficulty of securing railway freight and there was a fall in the output exported by the four stone and lime quarries working in the south of Shahabad.

TIRHUT DIVISION.

The local industries of the Tirhut division, such as indigo, sugar, tobacco, salt and saltpetre generally

continued in much the same condition as in previous years. The boom in indigo prices, was not maintained during the year. Champaran and Muzaffarpur did not succeed in getting high prices, and in some cases had to hold up the last season's outturn but Darbhanga planters are reported to have done better. In Darbhanga, too, the sugar industry had a good year, while the area under cane in Champaran shrank from 21,300 to 18,500 acres. Both sugar and rice mills were adversely affected by the curtailment of railway traffic. A new rice mill was built at Narkatiagunj in Champaran. Tobacco leaf is prepared, stored and dried at three places in the Darbhanga district by the Indian Leaf Tobacco Development Company with its local head-quarters at Dalsingsarai, and the tobacco industry owes much of its development to that Company. Messrs. H. Dear and Company retained their timber concessions from the Ramnagar estate, and in the Rajpur Soheria forest of the Bettiah Estate catechu was manufactured to the value of about Rs. 40,000. Exports of sabai grass were made from the north of the Bettiah sub-division. A new factory for making mother-of-pearl buttons and chains for watches was started by Babu Lalita Prashad Sahu, a banker of Motihari. The Superintendent of the Salvation Army Settlement for Magahiya Doms at Chautarwa started net-bag making on a small scale; and succeeded in producing from his looms dhotis, saris and Jharans of excellent quality. Export of red chillies was made on a large scale from parts of Roserah, Dalsingsarai and Samastipur thanas.

BHAGALPUR DIVISION.

The mica mines at Mahesari were worked to their full capacity under European supervision and are now employing over 2,000 workers a day. New mines have been opened at Paira and Jirulia, and also in Thana Chakai in this district. Slate quarrying by Messrs. Ambler and Company, Limited, prospered, and writing-slates are now being manufactured by the Company. Brick-making in Monghyr and the oil mills in Bhagalpur were affected by want of coal, and weaving by country looms in the former district by the high prices of materials. The weaving of coarse cloth by country looms received an impetus from the unusually high prices of the imported articles, and cultivators in Bhagalpur were reported to be interesting themselves in cotton cultivation. The Cigarette Factory of the Peninsular Tobacco Company at Monghyr continued manufacture on its previous scale, and *biris* of Jhajha and the *bafta* and *tasar* of Bhagalpur retained their place on the market. The two oil mills in Monghyr maintained production and local dyes did well. The dismantling of the Bhagalpur-Bausi Railway line during the year

for military purposes hampered local trade to a small extent.

ORISSA DIVISION.

As elsewhere country-made coarse cloth, owing to the high price of imported material, found its way in an increasing extent to the local markets. Silver filigree work and horn work were carried on as usual in the town of Cuttack. The boots, shoes and other leather articles produced by the Utkal Tannery at Cuttack, under the management of the Hon'ble Mr. M. S. Das, C.I.E., maintained their reputation in the market. The red oxide mine at Bhubaneswar did little business, as there was little demand for its produce by railways. The cocoanut trade, which is of much importance in Puri, suffered from the shortage of freight: stocks accumulated and could not be moved. Mica deposits were found in parts of Angul and prospecting operations were conducted by Messrs. Chrestien and Company of Hazaribagh. Ruby mica, suitable for Government purposes, has already been discovered in two places, and prospects are favourable. In Sambalpur also hopes are entertained of a further development of the mica industry. The Hingar-Rampur Coal Company continued to work and during the year a mining lease for coal was granted to Mr. T. P. Yeoman for an area of 1,300 acres. Applications for the extraction of *Chhui* (white earth) and for general prospecting leases for coal, iron, mica, etc., have been made, and prospecting for diamonds is being undertaken. Mr. Casy's sisal hemp plantation worked well, and is being extended. The alloy industry (*Kansa*) showed no perceptible development, owing to the indebtedness of the workmen.

CHOTA NAGPUR DIVISION.

It is in the exploitation of the rich mineral deposits of the districts of the Chota Nagpur Division that the greatest industrial development is to be found. The Tata Iron and Steel Company at Sakchi in the district of Singhbhum made a profit of one crore and eleven lakhs of rupees for the year ending June, 1917, against 68 lakhs in the preceding twelve months, and were busily engaged throughout the year in the supply of steel rails for Mesopotamia and other theatres of war. The coal industry in Manbhum was exceptionally prosperous, the total output being 10,287,909 tons. The Bengal Coal Company took up a large area in the Hutar coal-field from the Raja of Chainpur and started work preliminary to regular mining operations. The variety of minerals in Singhbhum illustrates the mineral wealth of that area. Iron and manganese ore are the most important: next comes copper followed in turn by gold, chromite phospheric rock, phosphate of lime, yellow and red ochre, wolfram, china clay, lime, asbestos and limestone. The companies owning the

largest concessions in that district are the Bengal Iron and Steel Company, the Tata Iron and Steel Company and the Indian Iron and Steel Company. Messrs. Bird and Company applied for a prospecting interest in over 10 square miles for manganese. Copper deposits are confined to the Dhalbhum estate where the Cape Copper Company, who have acquired large interests in the Rajdiha Mining Company, hold large areas in the name of the Rakha mines. The Company had, however, difficulty both in obtaining proper plant and competent workmen and in securing adequate coal and coke for their purposes in competition with Government and other demands on the coal mines. Next to the Copper Company Messrs. Octavius Steel and Company have large interests in all minerals except copper and precious stones, followed by Messrs. Gillanders, Arbuthnot and Company, whose interests are confined to copper. The Dhalbhum Gold and Mineral Prospecting Company, Limited, continued to work on the Porojama section; 3,648 tons were crushed, yielding 2,462 ozs. of gold, of the average value of 13½ dwts. per ton. Chromite deposits in the Kolhan were examined under the orders of the Government of India, by Mr. L. L. Fermor, Superintendent of Geological Survey, India. The Singhbhum Chromite Company and Messrs. Luxman Rao Naidu worked the mines in the Kolhan Government Forest for chromite, and the quantity extracted amounted to 1,158 tons valued at Rs. 9,266 and 659 tons valued at Rs. 15,116 respectively. In limestone the largest interests are held by the Sutna Stone and Lime Company in the Kolhan: this mineral will take an increasingly important place as a flux in smelting metal and as a raw material in the production of cement. There was a large demand for china clay, the most important interests in which are held by Mr. Grenon both in the Kolhan and Porahat estates and by Babu N. N. Goswami and Babu Motilal Ishwer Das in the Kolhan. In Hazaribagh the mica mines were worked under Government supervision to their fullest capacity. The joint East Indian Railway and Bengal-Nagpur Railway Colliery at Bermo and Baidkao continued to be developed. The Great Indian Peninsula Railway colliery at Khargali commenced work. Trade in timber forest produce and lac continued. *Sabai* grass provides a raw material in the production of paper; and the trade in that product benefited from the development of Indian mills to meet the shortage of paper imports from other countries.

Damage Done To Lac by Parasites.

The following is a summary of the available information on the subject of the pests that damage the lac crop. The information has been collated from the undermentioned publications of the Agricultural and Forest Departments.

- (1) *Lac (Lakh) and the Lac Industries* by George Watt. (The Agricultural Ledger, 1901.—No. 9.)
- (2) *A note on the Lac Insect (Tachardia lacca), its Life History, Propagation and Collection*, by E. P. Stebbing. The Indian Forest Records, Vol. I., Part I, 1908.)
- (3) *The Cultivation of Lac in the Plains of India (Tachardia lacca, Kerr)* by C. S. Misra. (Bulletin No. 28 (1912) of the Agricultural Research Institute, Pusa).
- (4) *The Indian Forest Memoirs on the Structure and Biology of Tachardia lacca, Kerr, with observations on certain insects predaceous or parasitic upon it* by A. D. Imms and N. C. Chatterjee. (Vol. III, part I, 1915.)

Ants of various species frequent trees carrying lac for the sake of the sugary excretion—technically known as “honey-dew”—exuded by the lac insect. They do not prey upon or feed upon the insect itself, but nip off the whitish hairs which carry air to the female within the resinous cell, doubtless merely with the object of getting them out of the way. The result is that the lac insect dies of suffocation and the whitish floss characteristic of healthy growth disappears. The cells become pitted and turn dark brown in colour. Sometimes the ants appear suddenly in numbers and if their appearance coincides with the emergence of the males, fertilisation is stopped. The ants, considering the males to be the producers of honey-dew, carry them away and prevent fertilisation. Messrs. Imms and Chatterjee hold that the ants do not appear to do any appreciable harm to the lac. They state that the ants “may in some instances seize the young larvæ or the male insects and carry them off to their nests, but they primarily come in search of the honey-dew. Several writers have emphasised the injuries incurred by the presence of ants but their statements do not appear to have been based on sufficient observation.”

Mr. Misra says: “Four kinds of caterpillars* feed on lac. Three of these appear in numbers a few

**Eublemma coccidiphaga*, Hmps. n.
Eublemma cretacea, Hmps. n.
Eublemma amabilis, Moore.
Hybatima pulverea, Mey.

days after the emergence of males in Katiki (October-November) crop from August to September. The female moth flies at dusk and lays eggs on or between the resinous cells. The caterpillar on hatching burrows into the cell until it reaches the female which it devours. Having destroyed one it moves on to another, making subterranean passages which it lines with silk and pellets of excreta. The characteristic webbing and the presence of isolated, loose, pustule-like spots on the inoculated branches are signs of the presence of the pests. If, therefore, the webbing be opened at the time with either a thorn or a sharp pointed stick, a small, whitish caterpillar with a black head will be found inside. These should be collected and destroyed. The other caterpillar also feeds on the lac insects on the trees as well as when the crop is harvested. These are small, slender, greyish insects with a black head. When full-grown they pupate within the lac encrustations and a week later a tiny, dark-grey moth comes out, couples and lays eggs. The webbing usually met with in stick-lac stored in bulk for some time is the work of the caterpillar. The easiest and most effective way of saving the crop from these caterpillars is to fumigate it immediately after scraping. If, however, the quantity of stick-lac be small, it should be washed and the seed-lac either stored or sold and the lac-dye used as manure. If, however, the quantity of stick-lac in hand be large, and the market rates be low at the time, it should be thoroughly dried in the shade and fumigated with carbon bisulphide before storage."

According to Messrs. Imms and Chatterjee, the lac insect (*Tachardia lacca*) appears to be one of the most extensively parasitised of all known Coccidae. Of the various parasitic and predaceous insects the best known is the small Noctuid moth, *Eublemma amabilis*, Moore. Of the 31 species of parasites, hyper-parasites, and predaceous insects affecting lac which came to their notice, 6 were Lepidoptera, 8 were Coleoptera, 14 Hymenoptera, 2 Neuroptera and one or possibly two species were Rhynchota. "All the Lepidoptera and probably almost all the Coleoptera are predaceous. Such predaceous insects seize and devour the *Tachardia* bringing about the speedy death of each individual they attack. They spend their life-histories external to the body of the host. Many of the Hymenoptera on the other hand are parasites, living within the body of the host, and slowly bringing about its destruction. Others of the Hymenoptera, e.g., Braconidae, are hyper-parasites, in that they are parasites of the injurious Lepidoptera and are therefore beneficial in their action." Life-histories of the insect enemies of lac are given in the Forest monograph by Imms and Chatterjee.

It is generally believed that the most serious damage to the lac from parasites occurs during storage; but it would appear that so far, no demonstration to show the percentage of waste caused during storage has ever been undertaken.

GRASSES IN ASSAM SUITABLE FOR THE MANUFACTURE OF PAPER PULP.

The following note dealing with the question of the possibilities of obtaining paper pulp from the elephant grasses has been sent to us by Mr. R. S. Pearson, I.F.S., F. L. S., Forest Economist, Forest Research Institute and College, Dehra Dun:—

A good deal of attention has been paid during recent years to the question of the utilization of bamboos for the manufacture of paper pulp, and two publications have already been issued by the Forest Research Institute on the subject. From time to time enquiries have also been made by interested parties as to the possibility of utilizing the elephant grasses for the same purpose, and a publication dealing with the chemical side of the question has been published by Mr. Raitt, entitled "Report on the Investigation of Savannah Grasses as material for Production of Paper Pulp" [*The Indian Forest Records* Vol. V, Part III]. Such enquiries cannot be considered complete without a consideration of the closely associated questions of total available outturn, yield per acre, cost of extraction to a possible factory site, local conditions, lines of communication, labour, etc., concerning which up-to-date nothing has been published. This subject has, however, not been entirely overlooked, and in 1916 and again in 1917, a careful inspection was made of the grass areas on the Monas river in Assam, with a view of collecting data on the above points.

An extensive grass area was found to exist in the angle made by the Brahmaputra and Monas rivers, on the east bank of the former opposite Goalpara, comprising the villages of Loti bari, Amguri, Pidardhara and Nayashastra, in the Barpeta subdivision of the Kamrup Division. The grass in this area is estimated to cover some 15,800 acres, while a similar area exists on the south bank of the Brahmaputra below Goalpara.

The most important species of grass found in these areas are Khagra (*Saccharum spontaneum*) and Batta (*Saccharum narenga*), with patches of Nal (*Paragmites karka*) on the more swampy ground. Sample plots were taken to determine the outturn per acre, in order to obtain an approximate estimate of the annual yield. The grass was cut over a given area and weighed green and again when dry, from which it was ascertained that Khagra

yielded 7'8, Batta 3'5 and Nal 8'04 tons per acre of dry grass. It would not be possible to crop the same areas annually, and Mr. Hole, the Forest Botanist, who has for years studied these grasses to determine their mode of growth, states that Khagra and Nal can be cropped every other year and Batta every third year. By adopting this rotation we get in round figures a sustained annual yield of 4 tons for Khagra and Nal and 1 ton for Batta. Khagra is found over a greater extent of the area than the other two species, so that were an average to be struck, based on actual areas covered by these three species, this average would probably work out to over 3 tons per acre; for safety's sake it is assumed that all three species occur in equal quantities, and under such an assumption we may expect to get a sustained yield of 3 tons per acre per annum or a gross annual yield of 47,400 tons per acre of dry grass, which put at a low yield of 33 per cent of pulp, gives over 10,000 tons of pulp per annum.

The cost of extracting a ton of air dried grass to a possible factory site at Jogigopa, a small tahsil town in the Bijni Estate, just below the junction of the Monas and Brahmaputra rivers, worked out as follows:—

Khagra (*Saccharum spontaneum*) per ton Rs. 7-8

Batta (*Saccharum narenga*) per ton Rs. 6-2-0.

Nal (*Phragmites karka*) per ton Rs. 8-8-0.

Hand samples of the above grasses were sent to England to be tested on a laboratory scale, while several tons were sent to an Indian paper mill to be made into paper. The results were satisfactory and proved that a very fair quality of paper can be produced from these grasses at a relatively low price. Small samples of such paper can be obtained by persons interested in these grasses from the Forest Economist, Forest Research Institute, Dehra Dun, who can also supply further details regarding the above described area.

It may be remarked that the Monas area was dealt with first by reason of its relative proximity to markets and sources of labour, and it may be superfluous to add that there are other very extensive and doubtless suitable areas in the Brahmaputra Valley and throughout Burma which have not yet been examined.

Dr. W. H. Brown, Ph.D., of the Bureau of Forestry, Philippines, has recently published a pamphlet on "Philippines Forest Products as sources of Paper Pulp," in which he deals with Khagra (*Saccharum spontaneum*) grass. He states that Mr. Richmond found that the pulp bleached to a good white colour with only 2'3 per cent loss in weight, by the use of 57 per cent of bleaching powder, calculated on the original weight of the material digested. These results confirm those obtained in India.

EDUCATION.

Teaching Profession.

We take the following from the *Times Educational Supplement*:—

Mr. Fisher, President of the Board of Education, speaking at a meeting of the Women's Citizens' Association at Ealing, said that it was an anomaly, and a great waste of money, that the population of the country should be divided into two sections—one, an aristocratic section, which received a full education through the period of adolescence, and the other a democratic section whose education was curtailed at the age of 14. In the Education Act, 1918, provision had been made to continue the education of the whole population of this country. They realized that the force of economic pressure was such that children could not be kept out of the Labour market after the age of 14. They felt, too, that it would be of no value for a child to continue its education after a long day's work. Accordingly, they provided that children leaving an elementary school at the age of 14 should have a short period of day teaching in the employers' time every week. We are out to educate citizens in all the tasks of citizenship, said Mr. Fisher, and we cannot afford to see human beings bound down by the tyrannous and mechanical machine of industry. We do not intend to interfere with their earning power or propose that their wages should be diminished, but we do intend to take out of their industrial time a few hours for education. Referring to the deplorable state of the physique of children, Mr. Fisher said that industry was becoming more mechanical and monotonous. It produced one-sided physical development which must be corrected by physical exercises. He believed that the Act of 1918, which provided for some form of physical exercise for all young people engaged in industrial toil, would enormously improve the physique of the population.

The whole secret of education, Mr. Fisher continued, depends upon the teacher. We have to work through human instruments, and no nation is well advised to allow its teaching profession to become discontented or unattractive to talent and devotion. The teaching profession is a disinterested profession, and there must always be a missionary spirit in the profession. I do not want it to be a highly-paid but I want it to be adequately paid. There is no calling which makes such a constant and continuous demand upon high spirits as the calling of the teacher. A good teacher should flood a classroom with his vitality. Only the day before, Mr. Fisher said, a measure became operative which would have the effect of ensuring adequate pensions for teachers, and, in addition, he had been the means of securing from the Treasury very large additional sums, both for elementary and secondary education, which would enable local authorities to make better provision for their teaching staffs.

14 POINTS ON HOLIDAYS.

In defence to the fashion of the time, Mr. H. A. L. Fisher, President of the Board of Education, placed the following fourteen points on holidays before the Educational Associations Conference :—

1. Plan your holidays carefully, but be ready to abandon your plans on the slightest provocation.
2. Never go north when you can go south.
3. A change of work is in itself a holiday.
4. Never drive when you can walk, and never walk when you can ride.
5. Take short cuts if you will, but remember that there is seldom time for them.
6. A good holiday is like eternity: there is no reckoning of time.
7. One of the best fruits of a holiday is new friendship.
8. Stay where you are happy.
9. Soak yourself in the atmosphere of a new place before you study the details.
10. The best holiday is that which contains the largest amount of new experience.
11. Holidays come up for judgment before the next term's work.
12. In the choice of holiday books act on the principle that one of the main uses of leisure is to feed the imagination.
13. The principal experts in the art of taking holidays are painters, naturalists, travellers and historians; the worst person to consult is a golfer.
14. On occasions a very good holiday can be taken at home—if you change the hour of breakfast.

Wide, vivacious, desultory reading of all kinds of books, continued Mr. Fisher, was the finest way of quickening the imagination, and was the best way of keeping alive. Quantity was almost as valuable as quality.

To keep books behind glass or on ill-lighted bookshelves was the summit of inhumanity; he had seen some school libraries that contained a ton of medium for every ounce of entertainment.

SANITATION AND PUBLIC HEALTH.

Railways and Public Health.

The following resolution of the Government of India on the subject of the influence of railway construction on public health has been issued :—

I am directed to address you on the subject of the influence of railway construction on public health, especially the questions involved in large aggregations of labour, the effect of borrow pits and the interference of embankments with the natural drainage of the country. These subjects have been engaging the attention of the Government of India for some time. Copies of a note by Lieutenant-Colonel Clemesha, the Sanitary Commissioner, with the Government of India, dated 27th September, 1916, and of a circular of the Railway Board, No. 430—W.—16, dated the 5th December 1916, are enclosed for information.

2. The Sanitary Commissioner lays special emphasis on the necessity of the control of congregated labour on railway construction and other large public works and in his opinion outbreaks of malaria and the general unhealthiness of large tracts of country are directly due to the deficient sanitary arrangements made during the aggregation of labour and the unsatisfactory conditions under which labour is housed and controlled. He suggests that greater co-ordination in respect of sanitary arrangements is necessary between the Sanitary Department and those responsible for the construction of railways and other works. To secure this object he has, in paragraph 11 of his note, outlined the constitution and functions of a committee. His suggestion for the appointment of a committee when railway and other large public works are taken in hand has the approval of the Government of India. The constitution of the Committee has been criticised by several Railway Administrations as being too elaborate. This, however, is a matter of detail, and the Government of India would leave to the local Governments, when they receive intimation that railway operations or other large public works are imminent, to settle in each case in consultation with the authorities concerned the constitution and the functions of the committee. The Railway Administrations have also accepted the proposals put forward by the Sanitary Commissioner that adequate arrangements for medical supervision of labour and for ensuring proper sanitary conditions should be made during construction; and the Government of India trust that similar steps will be

taken in the case of public works under the control of the Public Works and other departments of Government. It would, no doubt, be desirable to formulate proposals and to obtain the necessary sanction before the work began. In the case of large works, controlled and managed by private agencies, steps should be taken to ensure that the necessity for proper arrangements for the medical and sanitary supervision of labour is not overlooked.

3. It will be observed that the Sanitary Commissioner is of opinion that the results of borrow pits and the blocking of drainage on the health of local inhabitants have been exaggerated. He thinks, however, that in some areas borrow pits are undoubtedly the cause of a good deal of malaria and that in certain cases railway lines have caused serious obstruction to drainage; and he considers that in the neighbourhood of towns and railway stations borrow pits or objectionable. The Railway Administrations have generally agreed that borrow pits are objectionable. The Railway Administrations have generally agreed that borrow pits should not be dug within the boundaries of considerable towns and railway stations and that, when practicable, railway excavations should be made so as to drain off promptly and not result in stagnation near inhabited areas. The Railway Administrations have also accepted the suggestion made in the circular letter of the Railway Board that railways and local bodies should share the cost of filling up existing borrow pits and of draining all excavations in equal proportions, though reservations have been made by certain railways that they should not be required to carry out drainage or reclamation when for sufficient reasons this is not practicable.

4. The municipalities cannot legally be called upon to bear half or any portion of the cost of filling up or drainage the existing borrow pits and excavations dug by railways and the provisions of the Railway Act do not deprive municipalities of their statutory powers to require railways to fill up or drain excavations prejudicial to health. It is also desirable that when a scheme is proposed in this direction the Sanitary Commissioner of the Province should be consulted as to its necessity in order that no unnecessary expenditure may be incurred. I am to point out that expenditure on any scheme for drainage and reclamation incurred by the railway would be useless if the municipality proceeded against the railway alone without taking similar action with regard to other places injurious to health and that, as pointed out by the Sanitary Commissioner, the filling up of borrow pits would not in all cases assist in the prevention of malaria. The Government of India trust to the local bodies to exercise their legal powers in such a way as not to call upon the railways to incur

expenditure which would not serve a useful purpose.

5. It has been suggested that in some provinces railway companies should be encouraged to dig deep tanks instead of borrow pits in inhabited areas. In this connexion attention is invited to the remarks made in page 11 of Major Fry's first report on Malaria in Bengal to the effect that in certain areas deep tanks and borrow pits which contained sufficient water all the year round to enable the fish population to survive and which were free from weeds were rarely important as breeding places for mosquitos. This statement, is, of course, not applicable to all parts of India. But when it is applicable and where such deep tanks and borrow pits supply a local need, it is believed that the local bodies will be willing to contribute a fair share of the extra cost involved I am to commend the possibilities of this suggestion to the notice of the local Governments.

6. I am further to observe that it is generally agreed that the water logging in certain areas is due to the interruptions of the natural flow of water by embankments, canals, etc., which are insufficiently provided with waterways and that by such water-logging both the health of the people and, in certain large tracts of country, the productivity of the soil are prejudicially affected. Every endeavour should be made to see that natural drainage is not impeded and that, where it is already impeded, such impediments should be removed. This is one of the points which the Sanitary Commissioner in paragraph 11 (f) of his note has indicated as requiring attention when a new line is under consideration, but equally when the question is one of the removal of existing impediments to drainage the best results will be secured by consultation and discussion between the various interests concerned.

ENCLOSURE.

Letter—from the secretary, Railway Board.

To—the Agents, Assam-Bengal, Barsi Light, Bengal and North-Western, Bengal-Nagpur, Great Indian Peninsula, Guzerat, Madras and Southern Mahratta, North Western, Oudh and Rohilkhand, Rohilkhand and Kumaon and South Indian Railways, Agent and Chief Engineer, His Highness the Nizam's Guaranteed State Railway (through the Hon'ble the Resident at Hyderabad,) Manager, Jodhpur-Bikaner Railways.

Dated—the 5th December, 1916.

No.—430-W.

I am directed to inform you that the question of the influence of railway construction on malaria and the measures to be adopted for the prevention of the spread of the disease have been under the consideration of the Government of India.

2. The Sanitary Commissioner with the Government of India, who was consulted in the matter, has recorded his views in a note on the subject, and I am to enclose a copy of his note for your consideration. It will be seen from this note that the Sanitary Commissioner holds :—

- (a) that in some, but not in all, areas borrow pits cause malaria ;
- (b) that blocking of drains as a cause of malaria has been exaggerated ; and
- (c) that malaria is due mainly to the congregation of labour employed on railway construction or other large works.

3. To meet the danger referred to in (c) above, the Sanitary Commissioner considers that greater co-ordination is necessary between the Sanitary Department and those responsible for the construction of railways or other works, and he outlines in paragraph 11 of his note the best method by which co-operation between these authorities could be secured with respect to sanitary arrangements on such large works.

4. As regards (a) and (b) in paragraph 2, it has been suggested that, within the municipal boundaries of any town of over ten thousand inhabitants, no new borrow pits should be dug by railways, and that the existing borrow pits, if any, should be drained or reclaimed as occasion offers in consultation with the municipal authorities; half the cost of any scheme of drainage or reclamation that might be agreed upon being borne by the railway and the balance by the local body concerned.

5. I am now to ask that the Railway Board may be favoured, as soon as possible, with your views on the following points :—

- (1) whether railways are prepared to accept some general principle of the kind put forward in paragraph 4 ;
- (2) whether you agree that railway excavations should, where possible, be made in such a way as to drain promptly and completely into the nearest watercourse, and not result in stagnation of water in the neighbourhood of inhabited areas ;
- (3) whether the Sanitary Commissioner's proposals on the subject of medical supervision of labour employed on construction as to the sanitary arrangements of works are such that they can be accepted.

6. The whole matter is clearly one of great importance and the Railway Board will be glad to have your views on it.

SERIAL NO. 11.

Note on the influence of railway construction on malaria.

The subject of the influence of railway construction on the health of a district is a very large and extremely important one, and it will be necessary to make a few preliminary remarks of a general nature.

2. The issues that arise from the question of borrow pits and obstruction to drainage are but portions of a very much larger problem with which we are faced, and I am strongly of opinion that the best course will be to deal now with the whole subject rather than taking it up piecemeal. How large and important the influence of Railway construction on the health of a country may be, is extremely well set forth in an important article * by Bentley and Christophers. This article is of such importance that, in my opinion, copies of it should have been put into the hands of all large employers of labour at the time of its publication. I recommend it to the most earnest attention of the Members of the Railway Board.

3. It is unnecessary for me to repeat the general lines of argument of the paper, but it will be observed that, in several places, reference is made to the deficient arrangements for prevention of disease made by railway and other employers of labour resulting in ill-health to large tracts of country. I do not think that it can be denied :—

- (1) That owing to deficient sanitary arrangements, or other causes, during the aggregation of labour for construction work, epidemics of malaria and other diseases have occurred, and very large tracts of country have been rendered extremely unhealthy.
- (2) That railway and other authorities, not infrequently, incur unnecessary expenditure by not taking expert advice and making adequate sanitary arrangements for the protection of their working staff in unhealthy districts. An unnecessarily large amount of sickness and death amongst their employees thereby results and wholesale desertion of the labour force may occur.
- (3) That alterations in the natural condition of a locality occasioned by the construction of borrow pits and the blocking of drainage with embankments sometimes occasions the ill-health of the rural population.

*Transactions of the Bombay Medical Congress, 1909.

These may appear, at first sight, to be very dogmatic assertions, but the careful survey of the facts of the case will carry conviction as to their general accuracy. There can be no doubt whatever that in certain cases, the advent of a railway has resulted in a marked deterioration in the health of the community which it serves, and it is only by careful research and application of modern methods of sanitation that such untoward happenings can be avoided in the future. Probably the most important factor in such cases is the one mentioned in Bentley and Christophers' paper, namely, that railway officers, up to the present, have not recognized the danger incidental to any aggregation of labour in tropical countries.

4. Before discussing this matter further, it will be well to give certain concrete examples illustrative of my main contentions.

(1) As pointed out by Christophers and Bentley, it is now fairly certain that the extraordinary epidemic of malaria which occurred in Lower Bengal which was known as the Burdwan fever epidemic was due to the construction and opening of the railway between Calcutta and Burdwan. There probably were other factors concerned, such as the river bunds along the banks of the Damodar, but in the light of the most modern research on malaria probably the deciding factor in the case was the aggregation of labour and the expansion of trade caused by the opening of the line. The results of this epidemic are still with us. In parts of Murshidabad, Nadia, Jessore and Burdwan malaria is still hyper-endemic, and it seems almost impossible to break the vicious circle when one recognises that the natural conditions are all favourable to malaria.

(2) The case of Ennur is another example of the result of the deterioration of health of a settlement on account of railway enterprise. Not very long ago, before the railway was constructed, Ennur was one of the health-resorts of Madras. Since the construction of the railway bridge over the back water the place has been practically uninhabitable on account of the prevalence of malaria. All the bungalows are now unoccupied. The railway staff at Ennur was allowed to live some miles further up the line on account of the great prevalence of the disease. Prior to the starting of the railway construction works there were a few healthy fishermen in the neighbourhood and a large salt factory. Anopheles of a deadly character must have even then been present but there was no 'reservoir of parasites.' The advent of coolie labour for the construction of the bridge supplied this deficiency in the malaria cycle, and the anopheles did the rest. The

place is still very malarious in spite of endeavours on the part of Government of Madras to lessen the number of parasite-bearers by wholesale treatment with quinine,

It may be objected that the above two instances are very ancient and occurred prior to the proper understanding of the malaria problem, and that the explanation given is open to certain criticisms. It is desirable therefore to give some more modern instances.

(3) Amongst these is the epidemic of malaria in the Rajshahi division which occurred between the years of 1905 and 1909 at the time of the construction of the railway line between Godagarighat and Katihar. This epidemic was carefully investigated by a Sanitary Officer, namely, Major Mt. Combie Young, who demonstrated that there was a distinct correlation between construction of the railway and the amount of malaria in the districts concerned. The report is available for anyone who wishes to see it. Major Young also pointed out that the mortality amongst the coolies engaged on the work was very high.

(4) An instance of the serious results of lack of knowledge of the guiding principles of malaria came to my notice in 1914 in the arrangements for the construction of the line from Kishanganj to Siliguri. The bungalows for the Chief Construction Engineer, the Assistant Engineer, and the workshop were situated on what appeared to be a very suitable site on the banks of a small river. As a result of this, during the following malaria season the Chief Engineer and his wife, the Assistant Engineer and his wife, and every member of the workshop staff were down with malaria. The provincial preventive staff consisted of myself and two expert malaria officers, who were never consulted in the selection of this site; any of us would have been able to warn the officer responsible for the work that in the Terai, the banks of streams were absolutely deadly at certain times of the year. At this date also the only medical staff that was considered necessary for a line some 70 miles in length through probably the most malarious country in the whole of India was one hospital assistant. The amount of sickness and desertion on the part of coolie labour was very high indeed and the Railway Board are probably better acquainted than I am with the large cost of the work due to delays and enhanced rates to contractors caused by lack of proper medical arrangements.

(5) The final example of defective sanitary arrangements in connection with construction work to which I desire to draw attention is that of the Kidderpur Bracebridge Hall dock extension. I do not know whether this combined railway and dock extension scheme comes directly under the cognisance

of the Railway Board or not, but the necessity for proper organization of labour forces is extremely well exemplified in this particular case.

At present a comparatively small labour force is employed because the work is largely confined to the construction of dock gates and river frontage works, for which highly paid and skilled labour is necessary. When the ordinary excavation work of the main dock is commenced a large force of coolies will be required. I have made a careful survey of the whole locality and of the conditions of housing the small labour force which is at present employed, and I may say that the conditions under which these coolies live are extremely bad and require to be changed. The malaria survey of the district shows that there are mosquito breeding places in any number. Anopheline mosquitos also abound. The existing labour force is small, is very well paid, has been located on these sites for a considerable period, and does not contain a large percentage of parasite-carriers. That is the reason why malaria is not at present rife in the neighbourhood, but the advent of 8 to 10 thousand coolies from other parts of India, bringing with them a fair percentage of malaria parasite-bearers, is just the one factor necessary to start a violent epidemic as it did in Bombay in 1908. It is unnecessary for me to go here into details as to what should be done to prevent this evil. The point is that close co-ordination between the Engineering authorities undertaking the work and the Sanitary Department is necessary, if disaster is to be avoided.

5. I think the above instances will be taken as sufficient to prove my point. They could be multiplied almost indefinitely by hunting up the records of Civil Surgeons and Sanitary officer's reports. Allusion has been made to the epidemic of malaria in Bombay city in 1908. The Railway Board may not be in any way responsible for this, but it is an example of the careless aggregation of labour which brought in its train very dire results. Finally the old idea that cutting the earth and turning up the soil was the cause of malaria is now adequately explained by modern workers as due entirely to the unsatisfactory conditions under which the coolies were housed and looked after. It may be objected that quite a large proportion of the instances given above occurred in Bengal, which is notoriously a malarious country and, therefore, more liable to serious accidents of this nature. I am prepared to admit the force of this contention, but the main reason why Bengal instances are largely chosen is that they are best known to me. I have no doubt in my own mind that conditions are more favourable for serious and widespread epidemics in that Province and in Assam than

in most parts of India, but at the same time similar smaller and less important accidents are not unusual throughout the whole of India, and in touring about one frequently hears of them,

6. I do not propose to deal at length with the subject of cholera on railway construction works because malarial epidemics undoubtedly present the greater difficulties and any organization which is prepared to cope with these will certainly be competent to remove most, if not all, of the dangers of spreading cholera. That cholera is frequently visited on railway construction must be admitted: one has only to meet construction engineers from any parts of India to hear stories of epidemics amongst railway coolies which never find their way into any Government report or against which preventive measures are never undertaken until they have occurred. Very likely there has been an improvement in this direction in recent years, but more is necessary.

7. After so much adverse criticisms of defective methods, it is pleasant to be able to speak most highly of the excellent sanitary arrangements that were made for the construction of the Lower Ganges Bridge. There a skilled and energetic medical officer was appointed, he was given a large preventive staff: he was made a sort of Civil Surgeon of the districts adjoining his work and every possible care was taken of everybody on the work. The Medical Officer in charge worked in co-operation with the Sanitary Commissioner of the Province and received additional help from him in the matter of a Deputy Sanitary Commissioner to advise him on anti-malarial work, and financial assistance was also forthcoming from the local Government. The results of these sound arrangements are better known to the Railway Board than they are to me. The work of construction was completed well in advance of the promised time and, I believe I am correct in saying, with a considerable saving on the budget estimate. But these excellent arrangements should be the rule and not the exception.

8. Before closing I wish to say a few words on the relative importance of each of these three main criticisms given in the early part of this note. A careful perusal of Christophers and Bentley's paper will show the stress they lay on the importance of the aggregation of labour. In all probability this is by far the most important factor in the spread of disease; a great deal of the agitation in the lay press against blocking of drainage and manufacturing of borrow pits is wrong; in point of fact, the results they complain about should in reality be brought under this first head. Of course, the dangers resulting from the careless aggregation of labour vary enormously in different parts of this country, but

practically in no part of the country can the present unsatisfactory arrangements of collecting thousands of coolies together without adequate sanitary precautions or skilled advice be allowed to continue. The results of carelessness under this head are so far-reaching that no amount of trouble and expense must be spared in order to prevent accidents. It is impossible to estimate either the financial loss or the amount of suffering to a large number of innocent individuals that results from a widespread epidemic of malaria. As already pointed out, we are probably still suffering in Bengal from the direct results of an epidemic which was primarily started by the construction of the line between Calcutta and Burdwan in the fifties.

9. As regards the second allegation, it will probably be admitted by all in a position to judge that there is nothing so expensive as ill-health among the labour forces on the construction of a line; it is impossible to estimate the financial loss to Government of say two or three good construction engineers being invalided home on account of a preventable disease. In how many instances are estimates exceeded and difficulties multiplied tenfold due to sickness amongst the labour? Therefore, from a business point of view, everything should be done to maintain the whole of the employes, from the Chief Engineer down to the lowest paid coolie on the line in a good and efficient state of health.

10. With regard to the results caused by borrow pits and blocking of drainage, I consider that it is impossible to make any general statement; what is true in one place is hopelessly incorrect for another. The blockage of drainage is, in many parts of the country, a very serious affair, but I am inclined to believe that the amount of obstruction that is caused by railway lines that have been constructed, say three years previously, greatly exaggerated. Of course, it is a sort of parrot cry that the advent of railways always obstructs local drainage. As a matter of fact investigation of many of the lines shows that this is not the case, and the damage to health which is connected with the railways is probably, as already pointed out, due to the first cause and not to the obstruction of the drainage itself. Instances have, however, been brought to my notice where serious obstruction has occurred, and, I regret to say, where it has taken years to get the matter remedied. Very much the same remarks apply to borrow pits. In some parts of the country, borrow pits are most objectionable and are undoubtedly the cause of a good deal of malaria, particularly in such places as round the city of Delhi and Amritsar, in the Doab in the United Provinces, and in other places where flooding and stagnation of water appear to be powerful

factors. They are, I consider, a powerful factor in the spread of the disease along the line from Chittagong to Chandpur. On the other hand, there can be little doubt that in many places the borrow pits can have little influence on the health of the local inhabitants. I am inclined to think that, in a marshy country like Bengal, their influence on the general health is greatly exaggerated, and that careful investigation would prove this. As is all malaria problems, it is impossible to lay down hard and fast rules, and the only way of solving the problem is to have a careful inquiry made by a skilled officer in places where there may be any reasonable doubt. In the neighbourhood of towns, and close vicinity of railway stations, it is safe to say that borrow pits are objectionable and undesirable. More than this I do not want to say at present.

11. Within the last decade, the science of epidemiology and preventive medicine have made enormous strides. Much of the work that has been done is naturally not known to Railway and Irrigation authorities and other large employers of labour, but the time has now come when co-ordination between these and the Sanitary Department is pre-eminently desirable. I consider that the best way of attaining this object will be as follows:—

(1) As soon as the Railway Board have decided to construct any portion of a line and have decided on the route to be followed, information shall be given by the Railway Administration to the local Government concerned who will arrange to convene a committee consisting of—

- (i) Sanitary Commissioner of the Province,
- (ii) Chief Medical Officer of the Railway Company,
- (iii) Chief Engineer of the Railway, who is to carry out the construction work,
- (iv) Chief Engineer, Irrigation Department of the Province,
- (v) Commissioner of the division through which the railway travels or Collector of the district and the Civil Surgeon as may be thought desirable, and
- (vi) The Malaria Research Officer of the Province.

(2) This committee will meet, make study of the routes along which the line is to be constructed and will carefully investigate the following points: (they will record their opinion and will report to the Railway Board, and if necessary, to the local Government)—

- (a) The general health conditions of the country through which the line travels particularly as regards malaria.

- (b) The medical staff that will be required in order to supervise the medical and preventive arrangements for the construction of the line.
 - (c) To locate the places where hospital accommodation shall be provided.
 - (d) As far as is practicable to suggest to the railway company where labour camps should be arranged and what localities to avoid.
 - (e) To advise railway company as to the best sources of water-supply for the labour forces.
 - (f) The Chief Engineer, Irrigation Department, in consultation with the railway engineers will deal with the subject of the interference with natural drainage that might be caused by the railway embankments.
 - (g) The committee will also with the help of the Malaria Research officer study the subject of the influence of borrow pits on malaria of the district and will make such suggestions as circumstances demand.
 - (h) Some members of the committee preferably the Malarial Research officer and the Sanitary Commissioner will periodically inspect the line to see that the health conditions of the labour force are satisfactory and to make any recommendations that circumstances demand.
 - (i) To advise what villages in the neighbourhood are likely to be centres of spread of disease and to provide for the regular inspection and improvement of these.
- (3) In case of any difficulty the Sanitary Commissioner of the Government of India may be called upon to meet the committee and to decide any point.

12. The main point of these suggestions is to obtain all possible assistance from local Governments in helping the railway construction engineers with the soundest advice on the health conditions they will have to meet during their construction operations. Thus the Sanitary Commissioner, Civil Surgeons of districts and Deputy Sanitary Commissioners, will all be more or less at the disposal of the railway department and to assist the medical staff appointed to look after the actual work. I foresee that in actual practice arrangements will be made very similar to those that obtained at the Lower Ganges Bridge. In this instance the Chief Medical Officer was made particularly a Civil Surgeon of a small area; neighbouring villages were put under his

control; villages which were likely to act as disseminating centres for cholera and in which the labour resided were provided with a water-supply and were regularly visited by his sanitary staff; when the Medical Officer in charge was in difficulty on the subject of malaria a Deputy Sanitary Commissioner was lent in order to investigate any problem. In the event of any matter coming up from the local committee to which the Railway Board were not disposed to agree or which they considered to be unreasonable, they can always appeal to the Sanitary Commissioner with the Government of India, who will be prepared to investigate and advise. Railway Engineers may consider that the powers allotted to this committee are excessive and likely to interfere with the construction work; they must, however, be prepared for a certain amount of scientific control in matters appertaining to the health of districts. Judging by past results this has now become a necessity. Of course, the price of construction per mile may show some increase in the estimates, but the improved health of the staff will more than balance this, and we hope to do away entirely with the criticism which we are certainly open to at present, namely, that many square miles of territory are ruined from a health point of view owing to carelessness at the time of construction of railways. After all we are only asking for the application of the same principles that were necessary in the instances of the Panama Canal. In this rather extreme example the Panama Canal would never have been built at all had it not been for the thoroughly-organized service and preventive medicine. Visitors to the Canal Zone and critics of our administration in India frequently make the remark "why can't the Government of India do something of the same nature in this country." The time has come when we must act more or less on the lines of the American Government when they undertook to construct the Panama Canal through a very unhealthy part of the country. I think that the above suggestions will meet the case of India, at any rate, to commence with. We shall get experience as time goes on and modifications and additions to the above suggestions will certainly be necessary, but, I consider, that the above are a very fair beginning and will result in much good to the community at large.

SANITATION AND PUBLIC HEALTH.

Conference of Medical Experts.

A Conference of medical experts was held at Simla, on 23rd May at the Imperial Secretariat building. The Hon. Sir Sankaran Nair in opening the Conference said :—

I have invited you to come to Simla and to discuss together one of the most important subjects—perhaps the most important which can claim the attention of the professional expert and of the administrator of to-day. It is a matter of pride to us that India has made substantial contributions to medical knowledge. The Indian Medical Service has done splendid work and the names of some of our investigators have become household words. I hope to see this branch of medical activity go on increasing in scope and efficiency, and that India will continue to earn the gratitude of the world for the discoveries which her medical services make in the causes and remedies of diseases but I also want to see India herself benefit more freely from the application of the knowledge which she has produced. When I say this, I am sure you will all agree with me that we can claim the most revolutionary and certain discoveries in regards to malaria which carries off its hundreds of thousands in our midst every year. We can claim the theory of plague infection and yet for twenty-two years this scourge has infected our country. We are carrying on valuable research on the subjects of hookworm, leprosy and other diseases, yet our labour force is disabled by hookworm and the leper is too often found among our villages. Our rural tracts are insanitary, our cities are frequently maddles of unsatisfactory housing. These are matters which for long have been occupying my mind. Similar problems have recently come to the front in other countries also. Even in England, where sanitary conditions are so infinitely more advanced than they are in India, we have seen the introduction of a bill for creating a Ministry of health. The president of the local Government board in introducing it spoke of the loss of 700,000 of the English race in the battles of the great war and the monthly influenza mortality last year was as high as the average monthly mortality during the war. India has no doubt lost so heavily by reason of the war, but we have malaria, plague, cholera and other diseases ever with us and we have just had an influenza epidemic which, in some two

months carried off six million lives. In Egypt too elaborate proposals have recently been put forward for a ministry of health, with a wide ramification of workers in the provinces, some of whom will be in charge of public health work, others of clinical work, the health of school children, etc. When other countries are thus organizing, it is impossible for India to stand still and merely look on. We are constantly being criticised here for our delatoriness in dealing boldly with the problem, which confront us in the city, chawl or in the jungle ridden village. Such critics are apt to overlook what has been done in the matter of discovery, the gigantic scale of our difficulties and the Poverty of the Country but they have much truth in them and we cannot fold our hands while millions perish and national vitality is lowered. The weakness of our organization was brought into high relief by the epidemic of last year. Grievously as countries suffered from it, and great as the mortality must have been, even had India been normally equipped with facilities for medical aid, the appalling death roll had added a new and powerful argument, if indeed fresh argument were needed for drastic action. The time has come when we must take a bold step forward. The first thing is to obtain money. It has been said that public health is purchasable and that, within limits, a community has to determine its own death-rate. Here we have a population ignorant of sanitary affairs and too poor to afford the medical amenities which are found in western countries. I am convinced that public bodies and private individuals will not be blind to the dictates of humanity or the ultimate prosperity of the country, but the Government must lead the way. We have this year secured a sum of five lakhs as the nucleus of a public health fund. This is separate from the sum which we annually disburse for medical research. It is to be used in the application of medical science in a practical and work-a-day form among the people. You have been called together, as a body of experts, to advise the Government as to the best means of doing this. The agenda before you will show you some of the questions connected with this problem. First, we shall have to consider the central organization, its composition and its functions. You will have to consider relations of preventive action of clinical work and of medical research, and to what extent it is desirable to combine guidance in these activities in a single body. You will also have to consider the distinction between the administrative and advisory functions of such a body. I observe that the English public health ministry will not control the medical research organization, but you will perhaps think that the reasons which have led to this feature of the Bill are non-existent in India,

You will no doubt be influenced by the recommendations of the conference of the sanitary and bacteriological experts which I summoned at Delhi last December, and you will remember that a committee has just concluded its deliberations on the medical services in India. Secondly, you will no doubt advise upon the relations of the body with similar bodies which may be set up in the provinces. I need hardly remind you that the bulk of sanitary work is a provincial subject and that as provincial autonomy grows, this is likely to be even more so. It will not be difficult for you to define those international or inter-provincial questions in which a central body may legitimately exercise control, and to distinguish them from the great mass of purely provincial work in which the action of a central body must be limited to advice and assistance in times of stress. Thirdly, and to this I attach the greatest importance, I ask for your advice as to how best we may give practical assistance and encouragement to the provincial authorities in the struggle against disease. You have noticed, no doubt, that the commission on public health in Egypt claim that work of their epidemic department bears a favourable comparison with what has been achieved in India. My idea is a Mobile Corps of Workers lent in normal times to the provinces to supplement the provincial staffs, but ultimately subject to the orders of the Government of India acting on the advice of its public health board and liable to concentration in any area afflicted by a peculiarly virulent epidemic. Their arrowing accounts which have reached us of the condition of things in certain tracts during the epidemic of last October and November show how essential it is to have such a body of workers. In connection with this, you will consider the training which such workers should undergo and the qualifications they should possess. Another point is the equipment they will require, whether of travelling laboratories and their *modus operandi*. Finally, there are subsidiary matters such as the medical inspection of schools, the popularization of sanitary knowledge and so forth, on which I hope you will touch. You will see in this rapid sketch of the organization which we have in view that I have spoken of a body of practical sanitary

workers. The claims of research were considered when this money was secured, but it has been decided to expend the money on organizing sanitary work and supplementing our sanitary staff. The agenda before you, however, will introduce the question of a research institute as I regard this as of the highest importance, but though closely related to the sanitary work, it forms a separate subject and can be discussed here only in its bearings upon the questions which we have immediately in hand. Such an institute will provide the knowledge which the sanitarian will utilize and may play an important part in training. We already have our central research institute, our research laboratories and our schools of tropical medicine. These are bound to increase in number and efficiency, but it is impossible to regard India merely as a Fertile Field for Research.

We must apply in an increasing measure, to her people the results of the researches for which so many of those who have worked here are so justly distinguished. The things must proceed *pari passu*. They will react wholesomely upon each other and, I believe, that the sanitary organizations which will now be introduced are certain to supply research with a wealth of data and opportunity which would otherwise be impossible. I need hardly, in conclusion, impress upon you the magnitude of the problem which confronts us. I speak to a body of experts, who know far more accurately than I do myself, the extent of the miseries, the pain and the economic loss which disease annually inflicts upon the Indian population. I feel assured that you, as distinguished members of the most human of professions, will assist the Government with advice in the task of rescuing the population, from the danger which constantly assails it.

STATISTICS.

Imports of Paper into Madras.

The following statement shows the imports into Madras in the years ending 31st March, 1914 and 1917 :—

PACKING PAPER.

	1914.		1917.	
	Cwt.	Rs.	Cwt.	Rs.
Total, of which from ...	12,493	122,671	5,221	117,417
United Kingdom ...	4,703	52,439	4,187	95,195
Russia ...	373	3,061	18	150
Germany ...	6,322	56,516	84	814
Netherlands ...	527	5,305	107	3,639
Switzerland ...	353	2,700	24	640
Norway ...	...	...	688	13,596

PRINTING PAPER.

Total, of which from ...	64,197	902,266	47,071	1,584,488
United Kingdom ...	42,720	654,667	26,219	952,329
Sweden ...	2,630	26,948	2,172	55,339
Norway ...	2,134	22,249	10,983	299,556
Germany ...	10,623	122,398	37	980
Austria-Hungary ...	4,760	60,220	...	...
Japan ...	...	...	1,526	41,461

WRITING PAPER AND ENVELOPES.

Total, of which from ...	...	772,275	...	1,361,430
United Kingdom ...	...	649,571	...	1,243,076
Norway ...	...	1,120	...	18,848
Germany ...	...	36,687	...	1,870
Netherlands ...	...	10,938	...	1,380
Belgium ...	...	25,922	...	1,630
Austria-Hungary ...	...	40,382	...	...
Japan ...	...	87	...	64,096
U. S. A. ...	...	4,147	...	27,711

OTHER KINDS OF PAPER (including Paper Manufactures).

Total, of which from ...	57,007	474,657	17,638	669,495
United Kingdom ...	50,637	358,436	7,441	379,342
Sweden ...	530	7,415	8,442	204,699
Germany ...	3,376	61,754	1	30
Belgium ...	1,057	23,112	138	7,062
China ...	504	12,557	136	8,972
Japan ...	...	...	261	7,989
U. S. A. ...	71	2,437	169	6,627
Norway ...	18	300	470	13,920
France ...	4	140	159	29,660
Netherlands ...	396	4,948	135	7,120

(15 Rupees = £1.)

MYSORE ECONOMIC CONFERENCE. PROGRESS IN THE DISTRICTS.

Shimoga.

AGRICULTURE.

Cattle Show at Shimoga.—The report on the Cattle Show held at Shimoga on the 11th April was read and the Committee thought it necessary to hold a cattle show at Shimoga annually and resolved to refer the matter to the Agricultural Sub-Committee to work out a scheme to make the future shows quite successful.

EDUCATION.

A School Building.—The construction of the school building at Gangenahalli has been completed.

Contribution to the Mysore University.—Mr. Chinnikatte Eswarappa contributed Rs. 500 to the funds of the Mysore University, at the time of the Taluk Conference held at Honnali on the 15th March, 1919.

A Grant-in-aid School.—A grant-in-aid school was started at Chordi.

Opening of a Commercial Class.—The memo from the District Economic Superintendent, recommending the opening of a commercial class at Nyamati was read and the members resolved to recommend the matter to the Inspector-General of Education.

GENERAL.

A Modern Hindu Hotel.—The application from Mr. T. S. Vaidyanatha Iyer, submitted through the Economic Superintendent, in regard to opening a Modern Hindu Hotel at Shimoga, was read and it was resolved that a recommendation be made (i) to sanction a house rent of Rs. 50 per mensem, (ii) to advance a loan of Rs. 2,000 at 4 per cent interest, should the applicant furnish sufficient security, the loan amount being made repayable in five years.

Shows and Exhibitions.

CHUNCHANKATTE.

During the *Jatra* held at Chunchankatte in the Yedatore Taluk, a Cattle Show was held on the 16th January, 1919, in the compound of the travellers' bungalow. There were 17,941 heads of cattle at the Show, and a Committee of eight gentlemen with the Sub-Division Officer as President, and the Amildar as Vice-President was appointed to select the cattle deserving of prizes. The right to collect tolls on shops and cattle were sold out and a sum of Rs. 3,930 was realised. The Deputy Commissioner, the Sub-Division Officer, the Civil Veterinary Superintendent, and the District Economic Superintendent, besides the representatives of other Departments were present during the busy portion

of the *Jatra* and ran the Show. The Deputy Commissioner presided and gave away gold and silver medals and money prizes of the aggregate value of Rs. 220. Certificates were also issued and photos of prize winning cattle were taken on the occasion. The estimated cost of cattle sold was about Rs. 1,50,000, the best pair costing as much as Rs. 1,500. The total receipts were Rs. 4,475-10-10 and the expenditure amounted to Rs. 662-10-6.

In connection with the *Jatra* and Cattle Show, the Taluk Progress Committee arranged for the first time for a small taluk exhibition and demonstration in a pendal specially put up for the purpose. A weaving demonstration by the proprietor of the weaving school at Manchenahalli was also arranged for. Lectures were also arranged for and the Deputy Commissioner kindly presided over them. The Proprietor of the Sirahatti Dramatic Company kindly placed the pendal at the disposal of the Committee for delivering lectures, and he was also generous enough to place part of the income, Rs. 125, of a Drama at the disposal of the Taluk Progress Committee. The District Economic Superintendent conveyed the thanks of the Committee in an appropriate speech and a medal was awarded to the Proprietor on behalf of the company as a sort of recognition of his services.

MUDAKATORE.

In connection with the *Jatra* of Sri Mallikarjuna Swami at Mudakatore a Cattle Show was held in February last. There were 8,545 heads of cattle at the Show, the important varieties represented being (1) *Madeswara*, (2) *Bettadapura*, (3) *Amrut-mahal*, (4) *Hallikar*, and (5) *Nadudana*. A committee of eight gentlemen selected cattle deserving of prizes. Money prizes ranging from Rs. 5 to Rs. 10 and certificates were kindly distributed by Mr. T. Chokkanna, Deputy Commissioner, to the owners of deserving cattle. Out of the grant of Rs. 100 made from District Funds a sum of Rs. 68-8-0 was spent for prizes, etc., the balance with a sum of Rs. 131 realized by the sale of manure collected on the grounds, was credited to District Funds.

MADDUR.

On the occasion of Sri Narasimhaswami *Jatra* at Maddur, Mandya Taluk, a Cattle Show was held on the 22nd., 23rd., and 24th April, 1919. There were about 4,000 heads of cattle at the Show, and a committee of seven gentlemen inspected all the cattle and selected those deserving of prizes. The District Board sanctioned Rs. 50 for awarding prizes and there was a voluntary contribution of Rs. 2 by the Amildar. Four medals and four money prizes were awarded to the owners of deserving cattle. A special prize of Rs. 2 was given to a cow as the same was produced after the distribution was over.

QUERIES.

Hints to Correspondents.

Write on one side of the paper only. (2) Write each query on a separate sheet of paper. This will facilitate answering questions as in many cases they may have to be referred to experts. Put your name and address down on every such sheet. No attention will be paid to unsigned queries. (3) Drawings for illustrations should be on separate sheets of paper. They must be made in black ink only on white paper—not in pencil or colour—and twice the size they are intended to appear, especially reference letters and figures. (4) Put titles to queries, and, when answering queries, put the number as well as the titles of the queries to which the replies refer. (5) No charge is made for inserting letters, queries, or replies. (6) Letters or queries asking for addresses of manufacturers or correspondents, or where tools or other articles can be purchased, or replies giving such information, cannot be inserted except as advertisements. No question is answered through the post. (7) Letters sent by correspondents under cover to the Editor, are not forwarded and the names of correspondents are not given to inquirers. (8) As the space devoted to queries and replies is limited, they should be drawn up as briefly as possible. (9) To facilitate reference, correspondents, when referring to any letters previously inserted, should mention the number of the letter, as well as the page on which it appears. (10) All communications should be addressed to the Editor, *Mysore Economic Journal*, "Ringwood," Bangalore.

In reply to a question by Mr. Lambert in the House of Commons on Tuesday the Chancellor of the Exchequer made the following statement as to the cost of the war to the United Kingdom from August 4, 1914 to March 31, 1919:—"It would perhaps have been possible to answer the right hon. member's question with more confidence had he indicated in his question the assumptions on which he wish the calculations to be based. As it is, I give the answer with all reserve. After making the allowance usually taken for normal peace expenditure on the one hand and for debts due from the Dominions and Allies on the other hand, and after taking account of other Vote of Credit assets, the net cost of the war to the Exchequer of the United Kingdom up to March 31st last, on the basis of the Exchequer issues during the five years ending March 31st last, may be estimated in round figures at £6,700,000,000. These figures are, of course, exclusive of liabilities in respect of the war, accruing after March 31st last, and of losses to private citizens, localities, and trades in so far as these losses have not been made good out of the Exchequer." Mr. Chamberlain afterwards explained that in making this calculation he took credit for half the amount of the loans made by the United Kingdom to Dominions and Allies.

BOOKS IN BRIEF.

City of Toronto Report of Housing Commission.—*Housing Commission, Treasurers Department, City Hall, Toronto.*

This is an instructive Report from many points of view. How far can municipalities undertake housing operations? That is a point that has arisen already for solution in this country. The Toronto Commission do not favour undue liability on the part of municipalities. The following passage may be usefully quoted from their Report:—

"Moreover, house building is highly specialized form of activity, demands constant expert supervision, and does not lie within the compass of municipal duty. Private enterprise must, as in the past, be depended upon to a large extent to meet the increasing demand for housing accommodation. Nothing else can restore confidence, credit and stability in house property as a sound security for investment. Consequently, builders and investors should not be discouraged by the municipality engaging directly in house construction, and thereby entering into competition, with them. The City's chief contribution to housing lies in planning, in improved transportation facilities, in strict enforcement of building and sanitary laws, in rendering financial guarantees to responsible and bona fide housing companies, such as are herein-after mentioned, and in offering to sell or lease, its own vacant land on reasonable terms."

The whole report is well worth careful study by those interested in the housing question in India.

Imperial Institute Map of the Chief Sources of Metals in the British Empire.—*Imperial Institute office, London, S. W. 5 sh. 6d. (post free). Mounted on linen and folded.*

This is a useful map with diagrams of production for 1915 of the chief sources of metals in the British Empire. It has been prepared at the Imperial Institute with the advice of the Mineral Resources Committee. It shows the chief British countries of occurrence and production of metallic ores and the relation of their outputs to those of other countries in the world. We may add that copies of the map can be obtained from the Imperial Institute.

Statistical Abstract of the Baroda State from 1907-8 to 1916-17.—*Price Annas 5. Baroda Printing Works, Baroda.*

This is a handy volume issued by the Baroda State Department of Commerce and Industry. In preparing this Edition many mistakes found in the statements sent in by the Departments, since the publication of the Revised Statistical Abstract for 1916-17, have been

corrected. We are glad to note that Indian States are increasingly interesting themselves in issuing Abstracts of this kind. It is a sure sign of progress, for on correct statistics depends in the last resort all ideas of reform and improvement. We note with pleasure that the Baroda State is alive to the necessity of improving its system of collecting Statistics. That is a step in the right direction. In an Appendix to the volume we find a table showing the population, revenue, and expenditure for twenty years—1897-8 to 1916—17.

INFLUENZA.

Some Simple Instructions.

During the last year people in all parts of the world fell sick with a fever called influenza. After the fever had gone away many felt weak and suffered from small ailments. In the summer the fever was not dangerous, but it came back in the autumn and killed many people. It probably will come back again and all persons must be ready to guard against it. It is not possible to promise that proper measures will prevent all people taking it, but if people follow the advice now given, it will help greatly.

There is no law to make people careful to follow advice but for their own sake they should take the advice now given.

Influenza fever usually begins with sneezing and coughing and other people should keep away from a person in this condition; and a person who has fever and coughing and sneezing should not go near other people.

Keep well and try not to go near people suffering from this fever and if you have the fever try and keep away from other people.

Take food at regular times, get plenty of sleep, take exercise. Do not get cold and do not drink spirits. People will then be able to stand the fever better. Sneezing and coughing will give the fever to other people. Always cover the nose and mouth when sneezing or coughing.

Always work and sleep with windows open, wash out the inside of the nose and gargle the throat with one teaspoon of salt in a pint of water.

Do not go into room full of people and keep away from crowds.

Anybody with fever or sneezing should go at once to hospital or go home to bed, keep warm and send for a doctor if possible. Try and have a bed in an empty room or if not screen the bed off from the rest of the room. For the nose discharge, if handkerchiefs are used they should be boiled, if cloths or paper they should be burnt.

Do not return to work until quite cured. It is a danger to other people and, if work is started too soon, other sickness may come. Do not go to meetings or tamashas until the fever has been gone for seven days. Let the sun enter any room where a person has been ill with this fever.

Do not visit persons suffering from influenza. Remember that the disease passes from person to person almost always by close company and that open air and ventilation are the best preventives.

RECENT PUBLICATIONS.

Papers on Current Finance. By H. S. Foxwell. 8 $\frac{1}{2}$ × 5 $\frac{1}{2}$. xvii + 280 pp. Macmillan. 10 s.n.

Railway Re-organization. "By A Railway Officer." 8 $\frac{1}{2}$ × 5 $\frac{1}{2}$. xii + 108 pp. Spon. 6s. 6d. n.

Instincts in industry. A Study of Working Class Psychology. By Ordway Tead. 7 $\frac{3}{4}$ × 5 $\frac{1}{4}$. xvii. + 222 pp. Constable. 6 s.n.

The Financial History of Great Britain, 1914-18. By Frank L. Mc Vey, President, University of Kentucky. 10 × 7, v. + 101 pp.

On Payment of the National Debt. With "Proforma Assessments." By William Leighton Jordan. 8 $\frac{1}{2}$ × 5 $\frac{1}{2}$. 8 pp. Simpkin Marshall. 9d.

Economic Phenomena Before and After War. A statistical theory of modern wars. By Slavko Secerov. 8 $\frac{1}{2}$ × 5 $\frac{1}{2}$. viii. + 226 pp. Routledge. 10s. 6d. n.

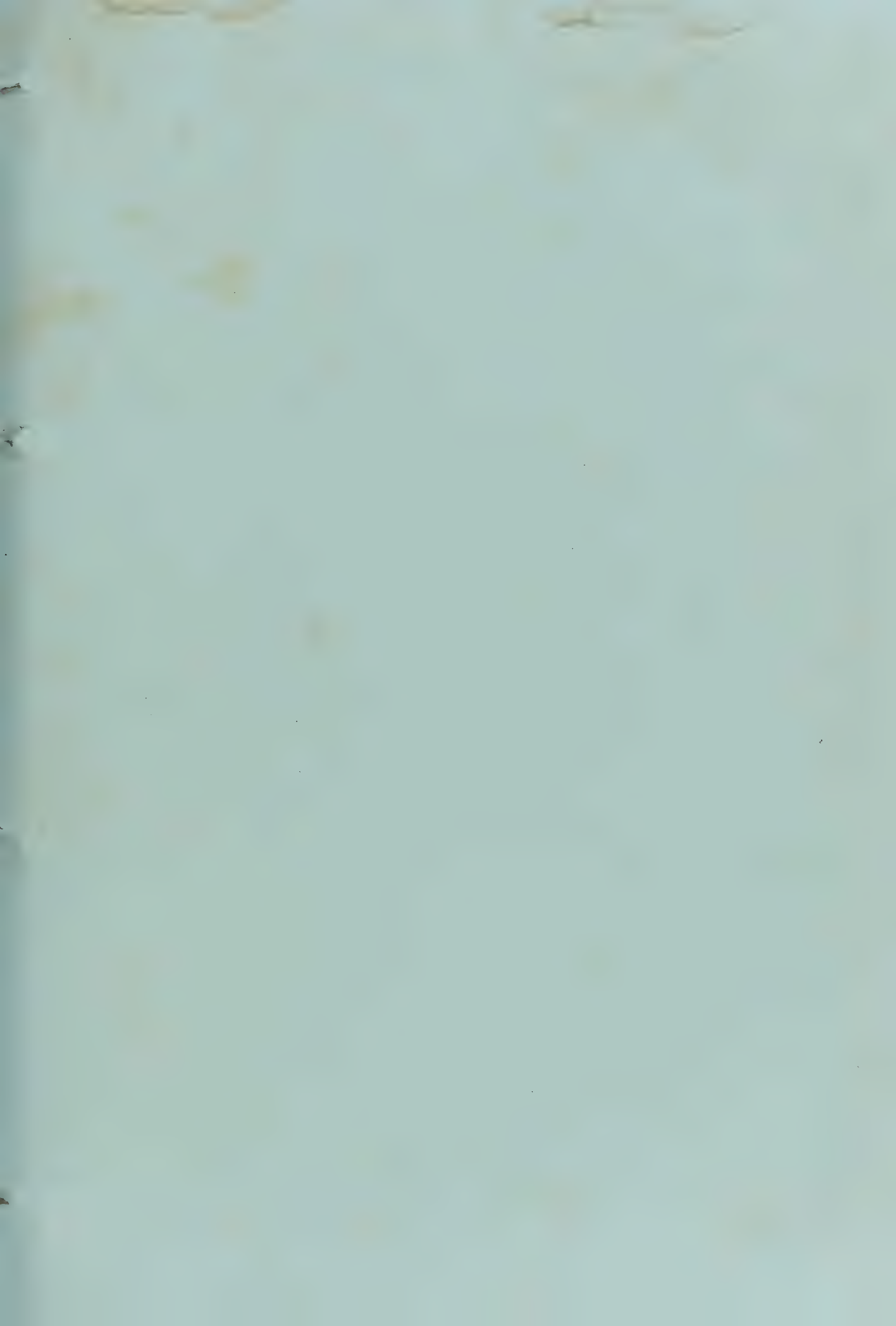
The Control of Public Finance and Officials. By Richard Higgs. 8 $\frac{1}{2}$ × 5 $\frac{1}{2}$. xii. + 234 pp. Dover: Dover Printing and Publishing Co. 10s. 6d. n.

Effects of the War upon Insurance with Special Reference to the Substitution of Insurance for Pensions. By William F. Gephart, Professor of Economics, Washington University, St. Louis, under the Carnegie Endowment for International Peace. vii. + 302 pp.

War Administration of the Railways in the United States and Great Britain. By Frank Haigh Dixon, Professor of Economics, Dartmouth College, Chief Statistician, Bureau of Railway Economics, and Julius H. Parmelu. 9 $\frac{1}{4}$ × 6 $\frac{3}{4}$. xiii. + 155 pp. New York and London; Oxford University Press. 4s. 6d. n. each.

The State in Peace and War. By John Watson, Professor of Moral Philosophy in Queen's University, Kingston, Canada. 8 × 5 $\frac{1}{4}$. xii. + 296 pp. Glasgow: Mac Lehos. 7s. 6d. n.

The State. Elements of Historical and Practical Politics. By Woodrow Wilson. Special edition revised to December, 1918, by Edward Elliott. 8 $\frac{1}{2}$ × 5 $\frac{1}{2}$. v. + 554 pp. Harrap. 10s. 6d. n.





THE RED MAURITIUS CANE—A HARDY VARIETY (S. ARCOT.)

The Mysore Economic Journal

A Monthly Periodical devoted to the Discussion
of all Economic Topics of Interest

PUBLISHED UNDER THE AUSPICES OF THE MYSORE ECONOMIC CONFERENCE

VOL. V

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No. 8

MYSORE ECONOMIC CONFERENCE.

BY THE EDITOR.

IN a supplement to the last issue of the *Journal* we published the Order of the Government of Mysore in the matter of the reorganization of the Mysore Economic Conference. As now constituted, the Conference as such is made a permanent adjunct to the administration with a central organization consisting of officials and non-officials to advise upon questions of economic importance and to co-ordinate all activities to the best advantage. In the districts, economic development work will become an integral part of the functions of the local self-governing bodies. The new central organization will consist of (1) a Central Board for organizing and co-ordinating the work of all the agencies to be known as the Economic Development Board, (2) three Boards corresponding to the three existing Central Committees, *viz.*, one for Education, one for Agriculture, and one for Commerce and Industries, and (3) a Board for Scientific Research and Advice. The General Conference will, in future, be a joint session of the Central Boards with other selected representatives, held once a year during the Birthday week to make suggestions and recommendations on questions of policy and call for information and discuss special

measures to be adopted for promoting economic development in the State. The composition of the membership of the Central Board, *i.e.*, Economic Development, will not differ materially from that of the Standing Committee which it displaces, though its strength is reduced to some extent. The total number of members excluding the President and Vice-Presidents, will be limited to twenty. Elected members are to hold office only for one year at a time. The Secretary to Government, Agriculture and Education Departments, will be Ex-officio Secretary to the Board. He will not be a member of the Board. The Dewan will be its President and the members of Council will be Vice-Presidents. Six Heads of Departments and the Revenue Commissioner, Chief Engineer, Chief Electrical Engineer and the Financial Secretary will be members. Each of the three Boards (Education, Agriculture, and Commerce and Industries) will elect three members to it. The Board will meet once in every four months. Its functions will be to discuss questions of policy, to make suggestions to Government and to consider schemes and proposals sent by individual Boards or referred to it by Government. It cannot exercise any direct executive functions.

THE CENTRAL BOARDS.

The Boards of Education, Agriculture, and Commerce and Industries as re-constituted will each have a member of Council, as now, as Chairman and excluding him will consist of not more than twenty-two. Each

chairman has, however, the power to co-opt additional members up to a limit of three—bringing the total to twenty-five. Opportunity is taken to provide representation on each Board of agencies working in the Districts, of the Representative Assembly and of other semi-official and private bodies in the State devoted to economic work of any importance and of any special interests (as planting associations, Inamdars, Chamber of Commerce, etc.) Each Board will have a whole time Secretary and members, nominated or elected, who can hold office only for one year. The Secretary will not, as now, be a member of the Board. The Boards will meet at least once in two months. The functions of the Boards will be the investigation of questions of Economic interest, carrying experiments, formulating schemes for improvements, collecting and spreading information of value by means of bulletins, lectures, etc., and generally advising the people in respect of measures to be adopted for their material and moral welfare. Ordinarily, the execution of schemes formulated by them and approved by Government shall rest with the Executive Department of Government. But in cases where Government specially so direct the Boards may themselves undertake the execution of any scheme prepared by them out of their budget. The Boards are allowed full initiative and financial autonomy subject to Budget provision. Larger powers are given to chairmen in regard to expenditure, the only limit being that no appointment carrying a salary of Rs. 100 or more can be made by them without the previous approval of Government.

WORK IN THE DISTRICTS.

With regard to economic work in the Districts, it is considered no longer necessary to have separate District Committees for the purpose. The functions of these Committees are accordingly handed over to District Boards. The Local Boards Regulation will be amended suitably to impose the duty

of promoting economic development work in each local area as an obligatory function on all District Boards. These Boards will have their three Sub-Committees (each to consist of not more than ten members) to correspond with the three Central Boards of Education, Agriculture, and Commerce and Industries. Separate rules will issue in regard to procedure, etc. Suitable grants will be given to the Boards to enable them to discharge the additional functions now delegated to them. The Presidents of District Boards will be held responsible for co-ordinating the work of the several agencies at work with a view to the attainment of practical results. They may appoint a special staff for special periods to carry out the work. This may include a special officer to work under the President, subject to the control of the Board, to assist the Board in co-ordinating the work of the various agencies in the District. District Boards will be responsible to Economic Development Board for the proper administration of the grants made to them. All executive work should, as far as possible, be carried out through the Departmental agency. Similarly in the case of Taluks, the Taluk Progress Committees will cease to exist, their functions being merged with or delegated to the Taluk Boards. In towns and cities, Municipal Councils are expected to undertake similar duties. In villages, Village Panchayats will attend to them and where these do not exist, the work will devolve on Village Improvement Committees.

THE ECONOMIC CONFERENCE.

The Conference will meet once annually during the Birthday week at Mysore. Its membership is increased to one hundred—members of Central Boards, seventy-five; Deputy Commissioners of Districts, eight; members of Legislative Council to be elected, two; members of City Municipalities, two; members of Town Municipalities, four; nominated to represent communities and interests, nine. Elected

members hold office for three years while all nominated members should vacate their seats every year. The functions of the Conference will be purely advisory. It has the right to interpellate on any matter of economic interest. It may offer suggestions, pass resolutions, ask for information, and discuss the Budget. The Secretary to the Economic Development Board will be its Ex-officio Secretary.

FINANCE.

The Budget allotment of the Conference will be for the present Rs. 2 lakhs, the expenditure on establishment being limited to Rs. 75,000. Separate orders will issue regarding the permanent and other establishments to be attached to the various sections of the Conference organization.

INTERIM ORGANIZATION.

Pending the re-organization of the Conference on the above lines, Government direct that the existing arrangements should be continued till the end of December, 1919, by which time the arrangements for giving effect to the new order will be made. The District Board Presidents are requested to take the necessary steps to transfer all Economic development work in the districts to the several local bodies in their areas and submit detailed proposals regarding staff, etc., before 31st October, 1919. The District Economic Superintendents cease to exist on 1st January, 1920.

Such, in outline, is the new scheme sanctioned by Government. Its success will depend more hereafter upon the people. Especially in the Districts, greater work will be expected from the people. It is up to them to show that they are alive to the new responsibilities entrusted to them. The Central Committees will have, under the new scheme, all the initiative they have hitherto had. They ought, in our opinion, keep a watchful eye on the work in the districts. Much may be done by individual members and in the last resort work of this kind depends on the interest and enthusiasm that individual members can bring to bear on their work. In the past, there have been not wanting members who have taken the lead in the districts in work of this kind and as the field for their useful work is widened now, it seems but right to expect from them in the future even greater activity in the matter of Economic development.

AN EDUCATION DELUSION.

By V. SUBRAHMANYA IYER, B.A.

THAT the existing system of Indian Education has been somewhat too literary and theoretical is a complaint heard all over the country and that it needs early correction is generally admitted. But the question has still to be answered, what is the corrective? Does the remedy lie, as is sometimes proposed, in the adoption of schemes like *Universal* or *Compulsory* training in handicrafts, which, they say, largely obtain in some of the western countries?

That the hand is as valuable an instrument as the eye or the ear for the training of the mind, is the belief of many psychologists and "*Manual*" Training is accordingly becoming a part of general Education, in the earlier stages. But whether "*Industrial*" training in handicrafts like Carpentry and Smithy, serves the same end, or whether it is advisable to make it *Compulsory*, especially at the higher stages, are points on which there does not appear to exist much agreement.

Such as are by nature intellectually incapable of rising to a higher level than the Primary school, have necessarily to seek training in industrial work. *Compulsory* training in handicrafts for the great majority of such pupils would certainly be justifiable. And inasmuch as the use of the hand and the eye is an important item in the primary courses, *Universal* training in the elements of some handicrafts might serve a useful purpose. A measure of this kind would certainly be welcome.

When, however, this doctrine of *Universal* and *Compulsory* training in handicrafts, in the secondary and higher stages also is advanced, one cannot but demur to it. For, evidently, in so far as the pupils at this stage

show that they are capable of higher intellectual work, it is inconceivable why every one of them should be forced to spend one's time in the shoe-maker's or the tinsmith's workshop ?

If Universal literary education is a mistake, it does not require a different logic to show that Universal Industrial training is equally a mistake. Does nature intend that all men should be manual labourers ? Are all minds of the same mould ? Are not the variety of aptitudes and tastes to be turned to account by being provided with appropriate opportunities to develop ? Why should one with a mathematical or literary turn of mind waste time, and that the best part of his life, in plying bellows or in sawing timber.

Does not a community require *non*-manual services ? Is it justifiable to ignore such needs and waste the talents of men required for such work on the acquisition of manual skill ? Not that there is no dignity or joy in slinging with brawny arms, the heavy sledge, or in merrily driving the yoked team afield. But is it not unfair to "compel" every son of man to employ his talents in what will be of comparatively little use to him in later life ?

Or, again, granting that every boy or girl of a community sacrifices some of his or her best years and attains some skill in the handicrafts, where are *all* the trained men to find work ? Are they expected to seek work in other lands ? Such industrial education will no doubt yield an abundant crop of cheap but skilled workmen for other exploiters of labour. But is that the aim of our Education ?

If the theory of *Universal* or *Compulsory* training in handicrafts in the secondary and higher stages is thus psychologically, sociologically and economically untenable, is Industrial Education not a corrective ?

Industrial training is invaluable, nay, indispensable. But it should be given to

those that have an aptitude for it. And even in the case of such as are destined to be manual workers, training in mere handicrafts on the lines hitherto followed in the West, is considered by competent authorities to be an undesirable course. For, the more the merely mechanical education in handicrafts is given the more mechanical the men and women become. The acquisition of manual skill is no indication of human superiority. For, even brutes with mechanical training perform wonderful feats in the circuses. Nicholas Butler, the well-known American authority on Education, not long ago said :

"The war has taught the lesson that..... to attempt to turn education into a merely mechanical process with a purely gainful end is nothing short of treason to the highest, most uplifting and most enduring human interests."

Nor is the Industrial Education of the kind now proposed to be given of any real value as an antidote to the existing evil. The schemes so far formulated are only an imitation of those adopted in western countries. And the results of such education those countries have already begun to deplore. Such education has been given, for instance, in England and France and this is what Mr. J. C. Paton (High Master, Manchester) has recently said, speaking of *Secondary Education* :

"The war has opened the eyes of the nation as never before to the weaknesses of our Industrial position."

The situation is not far different in France which has also had its scheme of Industrial Education:

Writing on 'Industrial Art Training,' J. P. Haney of New York says.

"France and England are now doing all that they can do to conserve every ounce of their own talent and prepare it for the commercial struggle coming with Peace treaty. Indeed all European countries are doing this,

and information which has leaked out indicates that Germany also is doing everything possible, with selected pupils in her three score of Industrial Art schools to enable her art industries to enter the commercial field in the shortest possible time after the peace is signed."

What then is the defect in these systems? *Such education in manual work as does not enable the workman to adjust not only himself but also his craft to the changing conditions around, is bound to be a failure.* It is this that has tended, to a large extent, to kill the crafts in India in spite of the high degree of skill the workmen had at one time attained. What gives vitality to industrial education is technical *intelligence*, in other words, scientific knowledge as applied to the different crafts, trades and industries. To quote Mr. Paton again:

"What has always been clear to a few is now patent to all, *viz.*, that without a higher standard and a wider range of *scientific* knowledge our nation stands to lose not only its industrial position but even its power of self-defence."

Neither mere imitation of foreign industrial schemes, especially those that are now considered effete, nor Universal compulsion will be of any avail. The real antidote to an overdose of literariness or bookishness, is not merely Carpentry or Smithy which only multiplies manual labourers and starves them to slow death, but the training in science and in its applications to every grade and kind of handicraft and of industries. It is this factor that directly increases one's efficiency as a workman in the worldwide struggle for existence. The application of science is not, as persons ignorant of science appear to imagine, confined to industries, such as, dyeing and weaving. It enters more and more into handicrafts, like carpentry and smithy also, where the scope for the use of *scientific* knowledge is growing every day.

It is a truism that in the world of Education "Uniformity" is death. And when it is combined with 'compulsion' matters become worse. Speaking on this subject Edmond Holmes, a no mean authority, says in one of his most recent essays:

"A cut and dried curriculum is imposed on them (pupils) with or without their consent, and no attempt is made to discover or help to discover in what direction their talents really lie. The result is that an arbitrary standard of intellectual worth is applied to them, by reference to which glaring inequalities among them speedily reveal themselves, inequalities.....ultimately decisive of destiny.....As the regime of compulsory discipline and compulsory instruction is distasteful to the health of the child in order to induce children to exert themselves they are urged and even compelled to compete against one another for prizes and other marks of distinction, and are thus taught to regard their classmates as rivals instead of as fellow workers and friends.....Give a child freedom for self-development, release him from the cramping and deadening pressure of.....*mechanical instruction*.....his spirit for realizing capacity for making the most of his natural aptitudes and inclinations will at least be kept alive. With such a school-life behind him, he will be.....ready to play his part as a useful and efficient member of the community." (The italics are mine).

Compulsion in the matter of Education is different from compulsion in the matter of *curricula*. The latter has to be avoided as far as possible. And it is a recognition of this fundamental principle that distinguishes modern Education from the old. And now, it is the old system that is sought to be reimposed, as if with a vengeance, by making mere *mechanical* training most obligatory.

If it is realized that intelligence or understanding is basic, *i. e.*, that it enters as a

common factor into the individual's success in every branch or subject of study, *compulsion* would be justified only in so far as it promotes the growth of this *common factor*. In all else, compulsion would be folly. Further, in the Secondary and Higher stages such schemes as fail to provide first and foremost for the exercise of intelligence by the application of scientific knowledge not only to industrial arts but also to handicrafts of all grades and kinds, be they carpentry and smithy or weaving and dyeing, or agriculture and apiculture, will lack that which is really life unto them. To ignore *science* as a part of such scheme is to starve intelligence, and to seek to produce automatons and slaves. But the need of the hour is not Industrial slavery but industrial self-reliance.

In other words, the evil of modern education is, as has been often said, its excess of "*intellectuality*!" And in fighting against this evil, reformers, not infrequently mistake "*intelligence*" for it, and seek to kill it forgetting that it is intelligence that is the most vital part of education. And there is no greater delusion than to think that the counterpoise to *literariness* is mere *mechanical* training in Industries. Woe unto the land that relies upon industrial or technical education without science!

Major David Davies, M. P., is at the head of a new cinema enterprise which proposes to erect "Super Cinemas" in England and India and to supply films all over the Empire. Two companies with a joint capital of £1,600,000 have already been formed and others will follow. It is proposed among other developments to make first class films based on British books. Another important phase of the undertaking will be the filming of great British industries such as coal, iron, steel, cotton and wool. In fact it is the intention to draw attention to Great Britain throughout the world by means of the screen. The enterprise is affiliated with the Famous Players-Lasky Corporation. Major Davies is also Chairman of the Picture Playhouses Limited, a company which has been formed with a capital of £1,000,000.

INDUSTRIAL RESEARCH IN THE U. S.*

By J. C. FIELDS, PH.D., F.R.S.

IN June, 1917, and in August and September, 1918, the writer visited centres in the United States where there were organizations for industrial research. The effects of the war in stimulating research were in evidence on both occasions. On the former visit these effects were manifested largely in attempts to supply pressing economic needs. When war first broke out the people of the United States were deprived of important articles which they had formerly imported from Europe. The research workers of the country were called on to devise means of producing either the articles themselves or effective substitutes. The results surpassed all expectations.

Synthetic drugs and chemicals, which were formerly derived from Germany, are now prepared in the United States. Certain high grade steel alloys, for which America looked to Austria, are now manufactured on this side of the Atlantic. The American dye-stuffs industry has been placed in a position where it can cheerfully meet all competition. In 1914 the United States produced less than \$2,500,000 worth of artificial dyes. In 1917 the output was more than \$57,000,000. The total annual production of the world before the war was \$92,150,000, of which Germany's proportion was \$68,300,000.

PRODUCTION OF POTASH.

The potash needs of the country are not as yet satisfied. Nevertheless in 1917 the product from various native sources totalled \$14,000,000. Of this \$8,000,000 worth came from the brine lakes of Nebraska and other States. The kelp of the Pacific Coast furnished \$2,000,000 worth and \$1,000,000

* With acknowledgments to the *University of Toronto Monthly*.

worth was provided by the molasses residue from distilleries. Only \$750,000 worth came from the chimneys of cement factories. Dr. Van H. Manning, the Director of the Bureau of Mines, to whose kindness I am indebted for these figures, expects that ere long half the needs of the country will be supplied from the last named source. He is hopeful, too, that a considerable amount will ultimately be recovered from the dust from blast furnaces. Much valuable work has been done by the Bureau of Mines in connection with the two last mentioned sources of supply.

When I visited the United States in 1918, practically all the research laboratories were busied on war problems. The research men were working under pressure and in one laboratory I was told that they were doing in one month what in peace times it would have taken the greater part of a year to accomplish. The laboratories were not as accessible as they were on my visit of the year preceding, and where one saw something of what was being done it was understood that much of it was of a confidential character.

When the United States entered the war, the research workers in the Universities and elsewhere volunteered their services. The scientific forces of the country were mobilized with results which have been far reaching. The achievements of science in the war cannot but appeal to the popular imagination. When the ban of secrecy is completely lifted and it is realised how multifarious and how important these achievements have been public opinion will surely insist on a more generous support of research and a better treatment of the research worker, both inside and outside the University. The manufacturers, including the smaller ones, are becoming more and more impressed with the potentialities lying in the application of science to industry. I was told of a manufacturer of woodenware on a small scale who took up the construction of aeroplane parts

and, in that connection, experienced the benefit of scientific advice. He stated that he had formerly had no faith in the scientist. He now realized, however, that many of his difficulties might have been solved for him ten years earlier had he been willing to consult a scientifically trained man. This instance was cited to me by a well-known chemist who also told me the story of a group of firms which had muddled over a problem until they had expended \$100,000, without result. They then came to him and stated that they were ready to spend \$100,000 more on the problem and that they were willing to wait five years for a solution. Three research men were put to work on it and the matter was speedily cleared up. The bill was \$2,000. The results attained have proved of importance in the war.

One of the laboratories visited by the writer last August was that of the Eastman Kodak Company, located in Rochester, N.Y. This laboratory employs a staff of forty research workers and costs \$150,000 for annual maintenance. When the United States declared war these research workers, together with certain others in the employ of the company, organized themselves into a teaching staff for instructing members of the air force in aerophotography. After a sufficient number of the latter had been trained so that they could do the teaching, the research workers returned to their laboratory and devoted themselves exclusively to war problems. Their services cost the country nothing, their salaries being paid by the company. The problems handled presented a considerable diversity in their nature. They concerned themselves, among other things, with anti-submarine devices, with liquid fuel and with aerophotographic apparatus. In particular, much time and ingenuity were expended in originating new types of color filter, that invention which plays such an important role in bringing out specific features

of a landscape as photographed from an aeroplane.

CO-OPERATION WITH UNIVERSITIES.

It may be noted that the Eastman Kodak Company is collaborating with the University of Illinois in manufacturing and selling at cost certain important chemical reagents. These reagents, which were formerly imported from Germany, are employed in chemical research.

Another large industry in Rochester is that of the Bausch and Lomb Company. The company employs nearly 6,000 workers and is the largest optical instrument company in America. Of its output 98 per cent, I was told, was for war purposes. Among its most important products are the rangefinders for the navy and anti-aircraft service. Some of those I saw were thirty feet in length. For the construction of rangefinders the very finest optical glass is essential. At the time of my visit to the United States in 1917 such glass was not to be had. In the meantime scientific men brought their skill and methods to bear on the matter and when I visited Rochester in 1918, a supply of optical glass was available which was equal to the best which had been imported from Germany before the war.

After leaving Rochester the writer visited Syracuse, Schenectady, Worcester and Boston. Near Syracuse is the laboratory of the Semet Solvay and the Solvay Process Companies. In this laboratory fifty research workers are employed. Much work has been done on processes for obtaining trinitrotoluol and on processes for producing benzalchloride and thence deriving benzaldehyde. A recent outcome of work done in this laboratory is a process for extracting potash salts from one of the larger brine lakes of California. They have also succeeded, in collaboration with Government chemists, in catalytically oxydizing ammonia for the manufacture on a commercial scale of nitric acid.

The laboratory of the General Electric Company at Schenectady was visited by the writer both in 1917 and in 1918. During the past year, I have, on several occasions, given details in regard to some of the achievements of this great research establishment. Dr. Dushman, too, a member of the research staff at Schenectady and a graduate of our own University, has recently lectured here on the work of the laboratory. It may, therefore, suffice if I mention that in August last the laboratory was given over completely to war work, that the members of the staff were in particular preoccupied with the submarine problem and that the expenditure on research in 1918 was more than double that in the preceding year. It would probably be a safe guess to say that the General Electric Company in 1918 expended on research in its various laboratories a sum which did not fall far short of \$2,000,000.

CONDUCT DEPARTMENT ON COMMERCIAL BASIS.

At the Worcester polytechnic it struck one as rather novel to find that the Department of Mechanical Engineering was conducted on a commercial basis. The Department has its own shops, with a weekly pay list of \$1,800. It possesses its own patents and manufactures apparatus for the market. In the year 1917-18 it did a business of \$220,000. At the time of my visit 95 per cent of the output of the shops was war work. A student, I was told, could help pay his way by working in the shops.

A number of pieces of research which had engaged the attention of members of the staff were described to me. In that connection stress was laid on the necessity of collaboration on the part of the engineer with the physicist and the chemist, as in so many cases his problems bring him up against difficulties of a purely scientific character.

Another engineering institution is the Massachusetts Institute of Technology, which is now housed in its magnificent

new buildings on the Cambridge bank of the Charles River. The Institute conducts a course in physics and chemistry which is specially intended to train men for industrial research. It has extensive research laboratories, which at the time of my visit were being utilized for war purposes. It is also well-manned—a prerequisite in order that individual members of the staff may find time for research. A point which I noted was the emphasis which is laid on the calculus as an instrument for the engineer.

THE A. D. LITTLE LABORATORY.

Not far removed from the Institute of Technology, on the bank of the Charles River, stands the laboratory of the A. D. Little Company, Inc. This is a model commercial laboratory, employing forty research workers. One of its products is cellulose acetate, from which artificial silk, bristles and other articles are manufactured. A complete pulp and paper mill constitutes a part of the equipment. There is also a distillery, which is working on the extraction of alcohol from bananas. At the time of my visit war work was being carried on in the testing of foodstuffs on a large scale for the United States Government and the New England Food Administration. A study was also being made of varnishes for aeroplanes.

An interesting feature of Dr. Little's laboratory is an industrial research museum. This museum, which is still in its infancy, has as its purpose to exhibit the historic development of a variety of industries which depend on research for their growth. For example, the evolution of cottonseed oil and its by-products from cottonseed is illustrated. What was here dead waste forty years ago now means, thanks to the research worker, a product whose value to the United States for the year 1918 was \$320,000,000.

Intermediate between Boston and New York I made a stay at Woods Hole, a Mecca for research biologists during the summer

months. Here is located the Marine Biological Laboratory, on whose staff by the way are several good Canadians domiciled in the United States, including the Director, Professor Frank Lillie, of Chicago. Investigations were under way on a variety of subjects. In particular, a good deal of work was being done on problems connected with heredity. A touch of the war was in evidence in that the effect of poison gas on cell tissue was being studied. The war too was responsible for an attempt which was being made at a station of the U. S. Fish Commission in the vicinity to obtain a substitute for gum arabic from the kelp which is found along the coast.

In New York the writer met a number of scientists with whom he discussed industrial research. Among these was Dr. Takamine, the eminent Japanese chemist, who is responsible for the research movement in Japan. Dr. Takamine informed me that a sum of \$5,000,000 (10,000,000 yen) was being raised to establish a research institute for physics and chemistry in Tokyo. The Emperor had subscribed \$500,000, Parliament \$1,000,000, commercial and industrial concerns \$2,000,000, and it was expected that the remaining \$1,500,000 would soon be in hand. The buildings are at present under construction. Members of the staff are now visiting other countries in search of the latest information, and will be on hand, prepared to assume their duties, as soon as the buildings are ready for occupation.

In its research undertakings the Japanese Government has been advised by Dr. Alcan Hirsch, of New York, who is also adviser to the Japan Dyestuffs Company, on whose capital of \$4,000,000, the Government guarantees 8 per cent annually for ten years.

On the waterfront in New York are located the laboratories of the Western Electric Company. These are the greatest laboratories of their kind in the world, and Dr. F. B. Jewett, the Chief Engineer, on his recent visit to Toronto told us something of

their weird achievements in the realms of wireless and multiplex telephony and telegraphy and in long distance telephony. It is now possible to hold more than one telephone conversation and to transmit several telegraph messages simultaneously over the same wires without the slightest interference or confusion. It is also possible for a man standing on the ground and speaking in his ordinary tone of voice to give orders to aeroplanes at a distance of ten or fifteen miles. These, among others, are recent advances made in the laboratories over which Dr. Jewett presides. The research workers in these laboratories number more than three hundred and the Expenditure on research for the year 1918 was approximately \$ 2,500,000.

At Wilmington, on the way from New York to Washington, are located the research headquarters of the Dupont Company. Here the annual expenditure on chemical research alone is \$ 2,000,000. Besides this, a certain amount is expended on research in physics and engineering. There are four chemical laboratories, employing in all 290 research workers. Associated with each of these laboratories is an analytical division, whose chemists, make analyses and do other routine work for the research chemists, in order that the time of the latter may be spent to best advantage. There are also forty-four chemists who are experts on the different process in which the Dupont Companies are interested. All told, there are 1,100 chemists employed in various capacities in the works. The total number of employees is 65,000.

The bonus system has been introduced among the research workers and a bonus may run as high as \$ 50,000. The policy of the Dupont Companies in this regard is somewhat in contrast with that of a large manufacturing concern, cited by Professor Stieglitz, of Chicago, which added a little over \$ 200 a year to the salary of the Director of its research work for a device of his which netted the company a profit of \$80,000, annually.

Another great research establishment whose upkeep for the year 1918 cost \$ 2,000,000 is the Bureau of Standards maintained by the Federal Government in Washington, D. C. Besides the current expenditure just indicated \$1,500,000 was being expended on new buildings. At the time of my visit there were 785 research men employed in the laboratories, besides which there were 75 men in the field. Of the 785 men here referred to, 300 had been detailed to do research work and were in uniform. I was told that about 600 problems a month were presented to the Bureau of Standards by the military services alone. Practically all the work of the Bureau last year had a bearing on the war. Of the problems handled 65 per cent were direct war problems. The remaining 35 per cent had an indirect bearing on the war.

Confidential reports were issued in bulletin form several times a month. These were sent to a limited number of persons, all of whom, with a few exceptions, were heads of military, naval or aeronautical departments or organizations. Each bulletin indicated in a general way the progress made on a number of problems.

The Bureau of Mines is also a federal institution whose activities are largely those of research. Its appropriation jumped from \$1,250,000 in 1917 to \$8,000,000 in 1918. Nearly all of the latter sum has been spent in connection with the gas warfare service. The Bureau had begun its investigations in connection with the gas warfare in February, 1917, that is to say, before the United States declared war. Its first investigations had to do with gas masks. These were later extended so as to include all sorts of materials and apparatus employed in gas warfare. It collaborated with the National Research Council, the universities and other bodies, as also with individuals. When in June, 1918, the Chemical Warfare Service of the National Army was formed, and the War Department took charge of the work which

the Bureau of mines had been doing in connection with gas warfare, the Bureau was able to turn over to the Department a complete organization, with a personnel numbering 1,800. This included a corps of 700 chemists.

The Bureau of Mines conducts investigations on metallurgical problems, on lignites, on the composition of coal and in its utilization. It studies, in fact, everything connected with mining. It has, for instance, done a great deal of experimental work on the flotation process for treating ores. It does work on the technology of petroleum and natural gas. The methods employed in obtaining oil have been very wasteful. For example, in Oklahoma oil has been obtained under circumstances which would mean a loss of \$75,000 worth of natural fuel gas for \$25,000 worth of oil recovered. In one field of Oklahoma, it has been estimated that the waste of fuel gas in one year was equivalent to \$5,500,000 tons of coal. A very large proportion of this waste can be eliminated, as the Bureau of Mines has shown, by employing what is called the mud laden fluid method. A very large proportion of the oil, too, from 30 per cent to 90 per cent is left in the ground. It is able to cause the adoption of practices whereby the production is increased 10 per cent, the Bureau of Mines estimates that the ultimate aggregate saving to the country will be \$450,000,000.

It would appear that the time is not so remote when the United States will have to look to its shales as a source of supply for oil. The Bureau of Mines has been studying processes for recovering oil from this source.

The Bureau of Mines has been instrumental in effecting a great saving in the by-products of coke. The United States had been wasting \$50,000,000 a year by using the beehive oven instead of the by-product oven in the coking of coal. A great change due to the war, came about in 1917 during which year 22,600,000 tons of coke

came from by-product ovens. This amount was greatly increased in 1918. During the latter year according to the Director of the Bureau of Mines the by-product ovens in operation were expected to produce 5,000,000 more tons of coke than if the coal had been coked by the beehive process. Furthermore he estimated that these ovens in full operation would produce 315,000,000 gallons of tar which could be used in the arts on which as a fuel would have the same efficiency as fuel oil. He also pointed out that they are capable of yielding 168,000,000 feet of gas or sufficient to melt 12,000,000 tons of steel in open-hearth furnaces. The by-products here in question have been of immense importance in the production of explosives for the war. They have made it possible too to establish the great American dyestuffs industry.

As a result of the war the American Government developed temporarily into the greatest manufacturer of chemicals in the world. Its appropriations for nitrate and sulphuric acid plants have run into the hundreds of millions. It has been suggested that the products of some of these plants be now utilized for the manufacture of fertilizers. In this connection one might remark that it has been stated on good authority that a reduction of the cost of soluble nitrogen compounds to a price comparable with that prevailing in Germany before the war would add \$1,000,000,000 to the annual value of crops of the United States.

THE FERTILIZER QUESTION.

The National Research Council has interested itself in the fertilizer question. It is felt that the farmer should be taught to use fertilizer. In the past, however, the fertilizer companies have not always been fair to the farmer. They have sold him constituents which were in many cases superfluous for his land. To remedy this abuse, the National Research Council has, with the concurrence of the Fertilizers' Association, organized a commission of five scientific men who will

be paid by the Association. This commission, in co-operation with the individual States, will undertake a survey of lands in the Middle West with a view to determining the specific needs of the soils in different parts of that region.

It might be well to here say something more about the National Research Council, as it is an organization of comparatively recent date which has already abundantly justified its existence and which promises to exercise an immense influence on scientific and industrial research and on the intellectual life of the country in general.

"In April, 1916, immediately after the attack on the *Sussex*, the National Academy of Sciences voted to offer to the President its services in organizing the scientific resources of the country. This offer was accepted, and the Academy was requested to secure the co-operation of all agencies Governmental, Educational and Industrial, in which research facilities are available. The national Research Council, comprising the chiefs of the technical bureaus of the Army and Navy, the heads of Government bureaus engaged in scientific research, a group of investigators representing educational institutions and research foundations, and another group, including representatives of industrial and engineering research, was accordingly constituted by the Academy with the active co-operation of the leading national scientific and engineering societies. To these were added representatives of the Government designated by the President."

Early in 1917 the National Research Council was requested to act as the Department of Science and Research of the Council of National Defence. On May 11th, 1918, the President of the United States issued an executive order in which he commended the work of the National Research Council requested the National Academy of Sciences to perpetuate its organization. At the same time he specified its functions as follows:

(1) In general, to stimulate research in the mathematical, physical and biological sciences, and in the application of these sciences to engineering, agricultural, medicine and other useful arts, with the object of increasing knowledge, of strengthening the national defence and of contributing in other ways to the public welfare.

(2) To survey the larger possibilities of science, to formulate comprehensive projects of research, and to develop effective means of utilizing the scientific and technical resources of the country for dealing with these projects.

(3) To promote co-operation in research at home and abroad, in order to secure concentration of effort, minimize duplication, and stimulate progress; but in all co-operative undertakings to give encouragement to individual initiative, as fundamentally important to the advancement of science.

(4) To serve as a means of bringing American and foreign investigators into active co-operation with the scientific and technical services of the war and navy departments and with those of the civil branches of the Government.

(5) To direct the attention of scientific and technical investigators to the present importance of military and industrial problems in connection with the war, and to aid in the solution of these problems by organizing specific researches.

(6) To gather and collate scientific and technical information at home and abroad, in co-operation with Governmental and other agencies and to render such information available to duly accredited persons.

Under its war organization the National Research Council counted more than one hundred members. It had as officers a chairman, three vice-chairmen, a treasurer, an executive secretary, and two assistant secretaries. With these was associated an executive board. The Council worked through eight so-called *Divisions*. The chairmen and vice-chairmen of these divisions

were members of the Council. This, however, was not the case with the great majority of the members of the Divisions.

The territories covered by the activities of the several Divisions are more or less vaguely suggested by their titles, as follows: (1) General Relations, (2) Military, (3) Engineering, (4) Physics, Mathematics, Astronomy and Geophysics, (5) Chemistry and Chemical Technology, (6) Geology and Geography, (7) Medicine and Related Sciences, (8) Agriculture, Botany, Forestry, Zoology, and Fisheries. Under Division (1) are included foreign relations, relations with educational institutions, industrial research, reconstruction problems, etc. Division (2) includes the Research Information Service. This service has branches attached to the embassies in London, Paris and Rome. The appointment of a scientific attaché to an embassy is an innovation for which the National Research Council is responsible. The departure has, however, been amply justified and the office is likely to be made a permanent institution. One of the functions of a scientific attaché is to keep headquarters at Washington informed on all scientific developments which take place in the country to which his embassy is accredited. Another is to place American army and navy officers in his vicinity in a position to obtain any scientific information which they may require.

The National Research Council has utilized workers in all branches of science. The laymen would hardly expect results of military value from an astronomer. Yet a remarkably expeditious method of reducing observations made in sound-ranging is due to a Princeton astronomer who has been working under auspices of the National Research Council Astronomers in the United States have also made important discoveries relating to the trajectories of projectiles and the dropping of bombs, and an American astronomer is said to have perfected a new instrument which will be of great use to navigators whether on the sea or in the air.

Another surprise for the layman is to be found in the effective war service rendered by the psychologists. At the suggestion of the National Research Council a psychological examination of the troops was undertaken. This proved a great success and sufficed in many cases to determine in advance that it would be impossible to fit a man for a given post.

Until the close of hostilities the activities of the National Research Council were almost wholly absorbed by matters relating directly to the war. It is now reorganizing and has already adopted a new constitution under which, among other changes, a modified classification of Divisions has been introduced. In the new arrangement the Divisions are grouped into two classes A and B. The Divisions in these classes are as follows:

A. Divisions of general relations: (1) Government Division. (2) Foreign Relations. (3) States Relations. (4) Educational Relations. (5) Industrial Relations. (6) Research Information Service.

B. Divisions of science and technology: (7) Physical Sciences. (8) Engineering. (9) Chemistry and Chemical Technology. (10) Geology and Geography. (11) Medical Sciences. (12) Biology and Agriculture. (13) Anthropology and Psychology.

We shall not here go into detail with regard to other changes in the Constitution of the Council. Its peace plans are not as yet completely defined. Whatever shape they may take, however, there is reason to believe that the necessary funds will be forthcoming from other than Government sources. Before the close of the war it was already planning an extensive campaign for the promotion of industrial research. In this it was to receive the support of some of the most prominent commercial and industrial men in the country as well as of men in the scientific and technological professions. On his visit to Toronto already referred to, Dr. F. B. Jewett informed us that the National Research Council is

now proposing that the leading universities found research professorships. He also told us something about the generous dimensions of the research fellowships which the council intends to establish the necessary funds thereto being furnished by corporations which have benefited by research. Last year the National Research Council received \$122,000 from President Wilson out of the fund of \$100,000,000 which was voted to him by Congress to dispose of as he deemed best for the national security and defence. Financial aid to the extent of \$50,000 was furnished by the Rockefeller Institute and the Carnegie Corporation of New York contributed \$100,000.

As a sign of the times, it may be noted that one of the largest corporations in the United States has under consideration a project for establishing a graduate school in connection with its laboratories where selected students on fellowships would be trained in research methods and whence later on the brightest among them would be drafted into well-paid positions in the Company's research department.

It may be pointed out that at a meeting of representatives of National Academies held in the rooms of the Royal Society at London in October last it was proposed that each of the allied countries should have a National Research Council and it was further more suggested that there should be an international Research Council made up of representatives from the several National Research Councils. What would Canada's part be in such a scheme? Is Canada doing all that she should do in the matter of research? A prominent American scientist in conversation with the writer stated that Canada should be doing as much research as the United States actually is doing and that the United States should be doing ten times as much as she is doing. If this statement is correct Canada's multiplier would considerably be in excess of ten.

THE GROWTH OF INDO-JAPANESE TRADE.

BY PROF. PANCHANANDAS MUKHERJI,
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THE practical cessation of our trade with the enemy countries—notably Germany and Austria—was taken full advantage of by our great Eastern ally Japan and by the United States of America—specially by the former.

If we go back to the year 1888-89, we find that imports from Japan were quite trifling “averaging less than three lakhs annually in the last five years.” Since then, however, the trade with Japan has increased by leaps and bounds from Rs. 10.92 lakhs in 1903-4 to 15.16 lakhs in 1909-10, Rs. 27.47 lakhs in 1912-13, and 52 crores in 1917-18. Of countries outside the British Empire Japan held in 1917-18 the premier place in the import trade (imports from Japan amounting to over 18 crores) and the second place in the export trade (exports to Japan amounting to 34 crores) being surpassed only by the United States of America. We have it on the authority of Mr. F. Shirres, the Director of Statistics, that imports from Japan last year (1917-18) had increased by 400 per cent the pre-war quinquennial average, while exports to Japan had increased by 103 per cent.

The increased imports from Japan are attributable to many causes. Within recent times the Japanese have established commercial agencies in India; they have been enjoying the great advantage of a direct line of subsidized steamers and low freights to India and they have banking facilities arising out of the establishment of branches

of their banks in India. They have, moreover, studied the Indian market more carefully than the majority of the importing countries, specially in regard to cheap and showy articles for which there is a large demand in India. The goods are placed on the Indian market in a way in which they are required, and although of very inferior quality are extremely cheap and it is well known that cheap, showy goods, irrespective of usefulness or durability, have a great attraction for the poverty-stricken masses of the Indian people.

The following figures relating to Japanese Imports into India compiled from the "statistics relating to the Sea-borne Trade and Navigation of British India" will be found illuminating:

Articles.	Year.	
	1913-14	1916-17
	Rs.	Rs.
Glass and Glassware ...	15,81,299	89,81,595
Matches ...	39,06,824	90,59,528
Twists and Yarn ...	13,91,562	53,10,723
Cotton Piecegoods. ...	14,04,731	236,000,00
Silk Piecegoods ...	1,17,60,296	1,17,30,791
Sugar ...	28,755	41,04,672
Hosiery ...	83,37,979	1,27,45,326
Hardware ...	4,97,979	50,02,348
	(in 1914-15)	
Liquors ...	...	11,34,144
Machinery and Mill-work ...	1,54,834	13,33,144
	(in 1914-15)	
Apparel ...	10,25,559	20,26,197

In regard to imports, it will be noted that in certain lines of the Japanese import trade such as cotton hosiery and piecegoods, silk,

glass and glassware, matches, umbrella fittings, machinery and mill work, tyres and tubes, cement, toys, sugar, and liquors. Japan's position is yearly growing in importance. As compared with the pre-war year 1913-14, glassware increased by Rs. 74 lakhs, matches by 52 lakhs, hosiery and hardware (chiefly enamelled earthenware) by Rs. 44 lakhs each, sugar by nearly Rs. 41 lakhs, and cotton yarn by Rs. 39 lakhs. Other noticeable increases were in regard to chemicals, paper, woollen goods, wood, brass, stationery (including wooden bobbins for jute mills), earthenware and porcelain toy, beer, haberdashery, apparel, buttons, tea chests, and cement. The most surprising and humiliating fact as regards imports is that India, the greatest sugar-producing country, should import sugar and cotton piecegoods in enormous quantities from a country whose exports of those commodities but a few years ago, were of negligible value. Fancy, Japan which six years ago exported only Rs. 28,755 worth of sugar now exports sugar worth more than 41 lakhs, *i.e.*, the value of Japanese sugar imported into India was more than one hundred and forty times of what it was six years ago in 1913-14. Again, cotton piecegoods which formed the chief article of import in 1916-17 was valued at 243 lakhs in 1916-17, as against the pre-war quinquennial average of only six lakhs, *i.e.*, the value of imports of Japanese cotton piecegoods in 1916-17 was forty times of what it was in the pre-war quinquennium. If we look at the amount (in yards) of cloth imported from Japan we shall similarly realise the phenomenal character of this increase.

Pre-war average	Grey un-traced	White bleached	Colored printed or dyed
1909-10—1913-14	2,559,000	48,000	5,21,000
...	72,278,000	2,602,000	18,679,000

A still more surprising and humiliating fact is that the Japanese cotton piecegoods are manufactured out of Indian raw cotton exported to Japan; for, ever since 1911-12 Japan has been on an average importing more than 17 crores worth of raw cotton and the cotton piecegoods woven out of it are being dumped on Indian and Chinese markets on an alarmingly increasing scale. The following extract from Mr. C. N. Wadia's speech at the recent annual meeting of the Bombay Millowners' Association will clearly explain the situation.

"At present owing to rebates, Japan can not only buy and carry away our cotton, but spin it and deliver it in China at no greater transport charges. Worse than this Japan has been able to bring back cloth woven from our cotton to Bombay and compete with our local mills in our local trade. Her increase of cloth importation into India in the last two years has reached the very high figure of 1,000 per cent. I am told on good authority that Japan has on order no fewer than three millions spindles—that is doubling the number of spindles at present at work in Japan. The future, therefore, cannot be viewed with equanimity if Government allow unrestricted dumping by that enterprising competitor, whose mills are worked 22 hours per day and whose owners have no factory law to comply with, who pay neither Excise Duty, Super Tax nor excess Profits Tax. Our China trade will be wiped out in the next ten years for a certainty unless energetic measures are taken to obtain cheap transport and unless an Export Duty is placed upon Cotton countries outside the Empire."

The following figures relating to Indian Exports to Japan compiled from the "statistics relating to the Sea-borne Trade and Navigation of British India" will be found illuminating.

	1913-14	1916-17
Rice not in the husk ...	1,61,58,289	26,606
Skins panned or dressed ...	13,25,673	17,21,032
Opium ...	17,98,700	23,83,070
Raw cotton ...	19,40,13,343	24,22,97,431
Raw jute ...	16,48,013	11,90,163
Gunny bags ...	13,79,355	27,78,412

The growing volume of Indian exports to Japan is largely accounted for by increasing exports of skins, opium, raw cotton and jute and gunny bags. Unhusked rice which formed one of the chief items of Indian exports to Japan is now a negligible item; in 1912-13, about 3 crores worth of rice was exported to Japan but in 1916-17 only 26 thousand rupees worth of rice was exported. This decrease is as remarkable as the increase in the value of exports of skins, raw cotton and jute, and gunny bags. One of the inexplicable facts of Japanese imports is the increase in the value of opium imports. Is the opium habit growing in Japan? or has this any connection with the Chino-Japanese quarrels regarding the surreptitious distribution of opium in China by Japanese hawkers?

While gratefully acknowledging Japan's services during the war period in filling the economic vacuum caused by the enforced withdrawal of the enemy countries from the Indian market and by the neutral passivity of industrial India and thus reducing to some extent, the economic distress in India, one cannot contemplate with equanimity the prospect of India being converted into the perennial dumping ground of the shoddy industrialism of Japan. If, as foreshadowed in the latest British Budget, Imperial Preference is to be the accepted tariff policy of British India, the first duty of the Finance Minister should be to raise the tariff wall against Japanese imports—specially of sugar and cotton piecegoods and to impose export duties on rice, skins and raw cotton.

WILL RAMIE CULTIVATION PAY IN INDIA ?

BY H. A. CARTER, A. C. R. A.

IT is now stated in London that textile inventors in the United States of America, who have been studying the matter for some time have devised a means by which ramie or China grass fibre can be easily spun into a very satisfactory yarn on ordinary cotton spinning machinery. This is a thing which has, so far, been found to be impossible to accomplish. Ramie fibre, as is generally known, is a much longer fibre in the staple than cotton, hence the difficulty which has been experienced up to the present time in spinning it successfully on ordinary cotton machinery. As, however, in the month of April the writer was shown by a friend of his, Mr. John Davis, a textile machinist, of 6, Egerton Grove, off Stretford Road, Manchester, Lancashire, a sample of fibre other than ramie, one which is also longer in the staple than cotton, which he, Mr. Davis, has lately succeeded in spinning into a good well spun yarn on ordinary cotton machinery, and given a sample of this last named yarn, the writer believes that the report from America that it is now possible to spin ramie and China grass cheaply, and successfully, on cotton machinery is true, and its effect should be very beneficial on this industry, which, like the growth and manufacture of cotton, is so closely associated with the Indian Empire. Mr. Davis has only found it necessary to introduce slight alterations in the method of cotton spinning to get ordinary cotton machinery to spin the other fibre in which he is interested into good yarn, a sample of which, together with a specimen of the raw fibre from which the same was spun, a species of vegetable silk long in the staple, the writer has forwarded to the Editor of this *Journal*, and the same

may practically be said in regard to the means said to have been devised in the United States for the spinning of ramie and China grass fibre in this manner according to the opinions expressed by experts here. Mr. Davis, for instance, considers it quite possible, and the difficulties which present themselves by no means unsurmountable. No doubt, the United States Government Bureau of Foreign and Domestic Commerce, Washington, D. C., U. S. A., will be able, if asked to do so, to place those interested in the matter in communication with the American inventors of this new method of spinning ramie.

If it now becomes possible to spin the fibre in the ordinary cotton mills of Europe, India, and the United States, and that with but little difficulty and expense, the world's consumption of ramie and China grass textiles should, and there is but little doubt will, increase considerably. The report further concerns the long fibres and not the "noils" or waste of ramie. Up to to-day it has been found that the machinery in cotton mills travels too fast to spin the fibres successfully, though an improvement is at once effected if the drawing rollers in this are placed farther apart from each other. At any rate, Mr. Davis has experienced but little difficulty in getting his long stapled vegetable silk to spin on this machinery which ordinarily travels fast. Ramie and China grass are the longest of all the textile fibres in the staple, the fibre is a long flat ribbon like one but just the fact of its length enables it to be spun into yarn without it being necessary to give it anything like so great a degree of twisting in the process as is absolutely necessary in the case of cotton, and all the shorter stapled fibres; in fact, it can be successfully spun with the very minimum of twist, therefore, if the torsional strength and elasticity possessed by ramie and China grass fibre are not quite so great as the torsional strength and elasticity possessed by cotton and flax, though some experts say that in

all well grown ramie they are, this does not militate against their easy and economical spinning into good, well spun, yarn. The much quoted Professor Julius Wiesner, of the Imperial School of Science, Vienna, is one of those fibre experts who declare (as the result of careful experiments carried out by him) that properly cultivated ramie, and China grass fibre is quite equal in these respects to the best qualities of flax, and it may be said, in passing, that he is much quoted as an absolute authority on fibre matters in the Encyclopedia Britannica.

This question as to the profit to be made by growing ramie in India, and, for that matter, in the British Colonies generally becomes, in view of these recent spinning inventions in the United States of America, one of increased interest and importance. Just before the War, Mr. Bernard Coventry, Inspector General of Agriculture for India, estimated the average crop of useful ramie fibre to be obtained in Indian cultivation, planting in the manner then followed, namely setting the plants at three feet distance from each other in the rows, and drawing the rows just three feet distance from each other, at one ton from each three acres cultivated, and the cost of cultivating at Rs. 313 for the three acres, which, he said, would show the planter a profit on his labour of £3 per acre if he obtained £30 per ton for his fibre decorticated in the condition of China grass, that is, having its outer skin or cuticle wholly removed, and this work being done by machinery. Since that time no doubt the wages demanded by the natives have increased but so also, it may be pointed out, has the selling price of all fibres, and that very considerably. While American Tully Middling cotton has been selling at 18'82 *d*, flax has been changing hands at much higher prices than this, and these enhanced values are certain to be maintained for a long time to come. Ramie and China grass have risen in price in sympathy, and may be quoted now at £85 per ton

for China grass. Considering to-days cotton and flax quotations China grass should pay the manufacturer well to use at 9 pence to 10 pence per pound, and it is never likely in the future to be sold as cheaply as it has been in past times. The monopoly of the spinning of ramie yarn for incandescent gas mantle base making has now passed out of the hands of the Germans, and has become more a British industry. The new ramie factories of Messrs. Wm. Ross, Limited, Clonard Mills, Belfast, Ireland, are at present spinning eight to ten tons of ramie yarn weekly for this trade. Very much more ramie is now used on the continent to blend with natural silk in manufacturing than was formerly the case, and the fibre is much liked there, also, for railway carriage, and general upholsteries, for the upholstery trade chiefly in Germany. The last travelling train made for the ex-Kaiser is said to have been upholstered in ramie fibre. If the machinery in existing cotton mills can now be easily turned on to working ramie the uses to which the fibre can be put in combination with cotton are many. When used as a base for all waterproof and rubber goods ramie bears without sustaining injury the high temperature, which rots cotton when it is employed for this purpose, at which the rubber is vulcanised. Blendings of ramie, therefore, in cotton cloths used for this purpose would be beneficial and would produce a superior base cloth. Mr. W. Haworth, a well known Lancashire manufacturer, said some years ago speaking of the use of ramie with cotton, "Ramie would make warps of the finest cotton goods, while the wefts could be made of Sea Island or other fine cotton. It could be used for the finest materials up to the coarsest." Ramie is only two-thirds the weight of flax.

Hemp of any kind never gives satisfaction for ropes for driving machinery because of the harshness and unyielding nature of the fibre. Instead of the fibres expanding, and

contracting "en masse" when bending over pulleys the individual strands act independently of each other, and set up internal friction which wears away the rope from the centre. Cotton ropes are, therefore, used largely for driving machinery but although they are more pliable than hemp ropes, still, they are subject to the serious disadvantage of a high range of expansion and contraction under varying hygroscopical conditions at the atmosphere, and cotton being a short staple the fibres get broken on the surface of the rope, and the wear and tear is rapid. These demerits do not apply to ramie ropes the expansion and contraction of which, when dry or wet, is very little. They are very much stronger than cotton ropes, and less liable to wear owing to the staple being much longer, and to the homogeneous structure and smoothness of the fibre the ropes also yield much more rapidly to the shape of both pulley and groove; especially do these remarks apply to ramie retted by the "Rossi" microbiological process in which no chemicals whatever, are used. Even blends of ramie fibre, therefore, in cotton rope manufacture will improve the wearing qualities of the ropes in every way.

At present there is great need of novelty and innovation in printed cotton goods. Now if the weft of these be made from ramie fibre, and the warps from cotton, the ramie used being that which has been chemically degummed, and which is silky, a fine silk-like lustre shows up well on the cloth, and the colours and styles obtained upon the same when they are dyed or printed are the very best. The colours are deep, rich, and quite uniform, while patterns in printing stand out bright and clear. "Rossi's" microbiologically retted ramie does not, however, suit so well for this purpose as it resembles fine quality linen, and has but little silky lustre, which, in this particular case, is what is sought for, and which by making the goods silky imparts to them a most pleasing, attractive, and very novel appearance.

By the use of this chemically degummed ramie fibre Dyers and Calico Printers could introduce quite a large description of specialite goods into these industries which the writer believes would meet with an extensive and very profitable sale. This should be particularly the case in India where, no doubt, as ramie is an Indian textile, patriotic motives would prompt the natives to purchase and use these Cotton-Ramie Union textiles. Ramie yarn, further, should be employed dyed in varying colours in cotton piecegoods to impart to them the coloured stripes which now are run along each side of these goods, and across their tops and bottoms at times, and for the small coloured figure effects so often met within cotton fabrics. If the ramie used is that which has been chemically degummed all these stripes and figure effects will show up quite silky. Ramie is the most hygienic of all textiles.

As in some localities the plant grows more luxuriantly than in others the distances between the plants to be observed in planting which will give the best results will suggest themselves to the planter after a little experience. If in consequence of overcrowding, or poorness of the soil the plants appear stunted and weak, then after having reaped the available shoots of the first crop transfer every other plant to fresh ground, and manure, and hoe the old land. Close planting, say 18 in. \times 18 in. every way distance apart, seems the best method to follow at the outset, because, it goes without saying, that if the planter finds this method to be overcrowding, and the plants to be stunted—which, however, it must be remembered may not prove to be the case—it is, at the outset, much easier for him to rectify his error by then transferring every other plant to fresh ground than it will be for him, if he finds that he has set his plants at too great a distance apart from each other at the beginning, to go back then and set additional plants in the vacant spaces of land on his fields on which no growth of ramie has appeared. Should it

prove the case, at the outset, that his 18 in. × 18 in. apart planted fields yield him a large and satisfactory crop of useful fibre, straightaway, then he has planted his land on the correct method at the start, and he has nothing further to do in order to succeed than to pursue that method without any change. The plants require to be placed on raised ridges for though requiring and using a fair amount of water they are liable, (especially those of the temperate climate variety, *i.e.*, that which has the under surface of the leaf silvery white), to be injured if water is allowed to lodge at the roots. Thorough drainage is therefore essential. The silvery leaf ramie, *Bœhmeria nivea*, is said always to grow best in a temperate climate such as that of the Northern parts of China, while *B. tenacissima* the Ramie of Assam, and the Malay Archipelago, it is said, which has the leaves green on both sides, with whitish veins, is a tropical plant requiring a warm equable climate, moist atmosphere and fairly good rainfall. Under no conditions, however, must either of these varieties of the plant be given more than just a sufficiency of moisture in their growth. If they are given too much, too little, or both of these in any one season, the strength and other good qualities of the fibre are damaged. The correct quantity of moisture to supply to the plants will, like the distances between them, suggest itself to the planter after a little experience. Land selected to grow upon should always be above inundation level. This is very important, and all authorities seem to agree that the best soil is a rich, light, not too sandy, loam, somewhat shady at first. The subsoil must be good and porous so that superfluous moisture may be carried off. The plant will grow in strong alkali soils provided the alkali is not carbonate of soda because the ground is shaded, and the evaporation going on through the leaves of the plants instead of at the surface of the soil will not accumulate the noxious salts around the root crowns so as to corrode them.

The following analysis of the Ramie plant by Dr. T. K. Hornidge will indicate the description of plant food required. 100 parts of the ramie stalks contain :—

Carbon	...	...	47.28
Hydrogen	...	...	6.26
Nitrogen	...	...	0.09
Oxygen	...	...	42.23
Ashes (or residue)	...	...	4.14
			<hr/> 100.00

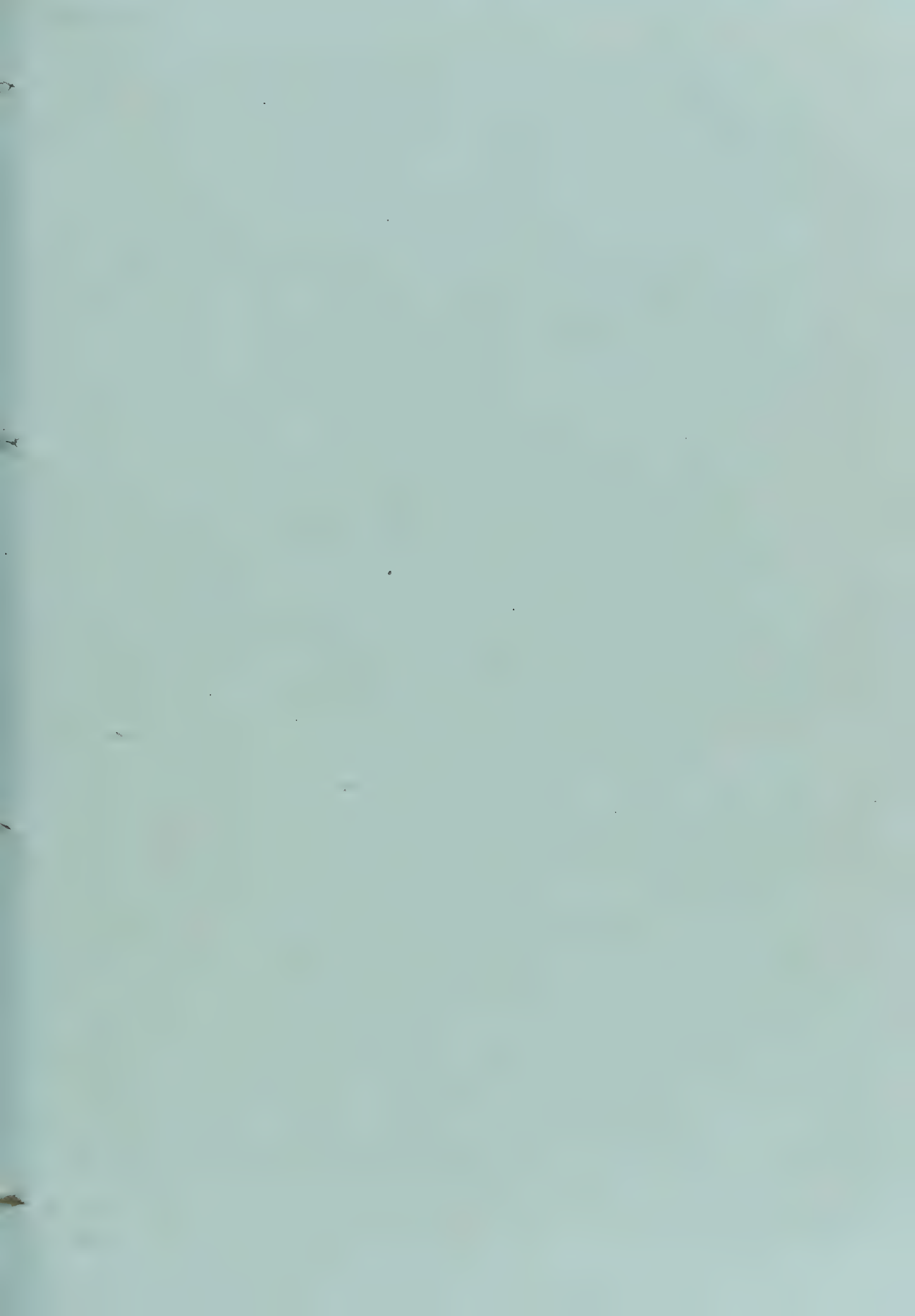
And in 100 parts of the Ashes (or Residue):—

Carbonate of Potash	...	32.37	per cent	}.
Do Soda	...	16.39	"	
Lime Carbonate (chalk)	...	8.40	"	
Magnesia	...	5.39	"	
Salts of Iron	...	...	"
Common salt	...	9.13	"	
Phosphoric Acid	...	9.61	"	
Sulphuric Acid	...	3.21	"	
Carbonic Acid	...	8.90	"	
Silicic Acid and Sand	...	6.60	"	
			<hr/> 99.90	per cent

* or 48.76 Alkalies.

It is a fact that 1,600 pounds of useful ramie fibre have been got in the South of France in culture per acre, per annum, and 1,280 pounds at Padua, Italy, in a climate similar to that of the South of France. This is worth remembering when we consider the claim made by Mon Faure, of Limoges, Haute Vienne, France, that he gets equal to 4,480 pounds of useful ramie fibré per acre, per annum, from his field of rather more than one-third of an acre at Limoges, which the British Consul at Limoges, Mr. G. S. Boddy, says, after a recent visit to this field, he believes to be quite true. The Limoges yield is just 2,880 pounds per acre, per annum, more than the first yield named for the South of France in this article. The increase is considerable but the fact that 1,600 pounds has been earlier obtained goes far to prove that the size of the Limoges crop has not been overestimated, and to show what results may be obtained in the right soil and climate.

In a book published in London "Brazil in 1913" by T. C. Oakenfull, the author states





I. ANOTHER VARIETY OF THICK CANE—JUST BEING EXPERIMENTED.

that one hectare ($2\frac{1}{2}$ acres) of land in Brazil should yield four crops of ramie yearly of 40 tons each=160 tons, in all, at 16s. to 20s. per ton. This apparently refers to the green crop of stems and leaves, and means a production of 64 tons per acre, which at 5 per cent clean fibre yield would give about 2 tons of useful fibre per acre, per annum.

A climate resembling that of the South of France would, from all we know, seem to be the ideal climate in which to grow ramie, and various parts of the world possess this climate, India possibly included, the latter will be best known, in India! If it is the case, excellent crops should be got in these districts.

Some have suggested that ramie is somewhat lacking in power to withstand compression. All fibres are subject to compression when as yarn they are woven into cloth in the loom. This may, or it may not, be the case in connection with ramie. Careful tests of Rossi's microbiologically retted ramie, and of efficiently chemically degummed ramie such as that produced, for instance, by Le Societe Des Usines de la Ramie Francaise, (P. A. Ravieret Cie), 10, Rue d' Hanteville, Paris, by experts, in such manufactured condition, yarn or cloth, as is most suitable, alone will decide this point definitely but, here it may be observed, that Prof. Alfred Barker, M.Sc., of the University, Leeds, Eng. has recently devised a new power-loom, specially for the weaving of ramie, and artificial silk yarn which he says will put less compression upon these textiles, and humour them better, generally, than will even the hand loom. In the writer's opinion, however, as in that of Prof. Barker, all the defects which some alledge are possessed by ramie fibre to a greater or less degree are to be ascribed wholly, either to bad machine decortication, or bad chemical degumming, and not to any faults inherent in the "crude" ramie, or China grass fibre itself. Planters should experiment, on a small scale to commence, in the growth of ramie.

THE SUGAR-CANE INDUSTRY— A LESSON FROM SOUTH ARCOT.

BY N. R. SUBBA AYYAR, M.A., L.T.

THE phenomenally large imports of Java sugar into this country and the high retail prices now prevailing in the market have tended to focus our attention on the improvement of the sugar-cane industry of India. Again, the constantly increasing consumption of sugar in all countries of the world and the complete cessation of the imports of beet-root sugar from Germany and Austria have given an impetus to the Indian industry. And, therefore, the question is being freely discussed if India can take advantage of this opportunity and grow sufficient sugar-cane to meet the needs of home consumption and also become an exporting country as she once was. The news of the appointment of a strong Commission of sugar-cane experts with Mr. McKenna as chairman to explore the possibilities of the Indian sugar Industry is, therefore, to be hailed with delight and we doubt not that the labours of this Commission would result in placing this very important Indian industry on a secure footing.

The difficulties that have till now stood in the way of any large extension or improvements in the sugar-cane industry of this country are chiefly four in number, *i. e.*, the poor character of the canes grown, the very small holdings on which the crop is cultivated, in sufficient water-supply, and inferior methods of extracting sugar. It is the aim of this article to show how these difficulties have been largely overcome in the South Arcot District of the Madras Presidency where a large up-to-date factory has been successfully working for the past two decades.

At one time, and that not long ago, a thin whitish cane was the only one grown

by the ryots in this district. It was a poor variety and easily ravaged by jackals and other animals. But thanks to the unremitting efforts of the Madras Agricultural Department these ryots fully appreciated the advantages of growing a thicker and better class of cane, the value of which had been demonstrated to them by Government Agricultural Farm at Palur. In a few years the cultivation of the poor indigenous variety was completely given up, and in its place the Red Mauritius cane was grown. To-day it is impossible to see any tract round the Nellikuppam Factory growing the old cane. The Red Mauritius is the favourite of the ryots. Better varieties are being grown experimentally, but the ryots have not been induced to take to their cultivation on a large scale with any great enthusiasm. They are perfectly satisfied with the thick Red Mauritius. Thus we see that the Indian ryot is not after all so hopelessly conservative. He evidently understands his business and is not slow to give up his traditional ways if only one is satisfied with the results of new experiments and improvements in agriculture.

The sub-division of land in India is another real difficulty in the way of large agricultural improvements. The holdings of the ordinary ryots are so small and scattered that the use of up-to-date machinery is not possible on a large scale. When a tract of agricultural land is fairly large and compact, irrigation from wells by Oil Engine Pumps, and ploughing by Motor-driven machinery can be successfully undertaken. In the case of sugar-cane, carting charges to the factory can be reduced to a minimum if the cultivated area is large and near the factory. So small holdings should give place to large ones if the sugar-cane industry is to be extended and improved.

This great difficulty of small holdings has been successfully overcome in the South Arcot District by the factory taking over all

the small holdings in a certain area on a ten year lease or even a fifteen year one. The whole tract thus acquired by lease is levelled and put under motor-driven ploughs. Manuring, irrigation and general superintendence are thus rendered easy, and the strain on the ryots' cattle in ploughing and in lifting water for the crop is, therefore, considerably reduced, while the canes are easily and regularly carted to the central factory. When the lease is about to expire, the ryots are given the option to take back their holdings or lease them again to the factory. In the former case the land is again subdivided and plotted and the boundary carefully marked and the holdings handed over to the owners.

This system seems to us to be a very successful solution of the problem of small holdings in India. The very fact that the ryots are willing to lease their holdings again shows that in their opinion the transaction or the contract with the factory is on the whole advantageous to them. It should therefore be possible for a co-operative concern to take on lease the small holdings of the ryots in other places and employ modern agricultural machinery in the cultivation of sugar-cane.

The next difficulty which the sugar-cane cultivator has to face is insufficient water-supply. But where large stores of subterranean water are available, Oil Engine Pumps can be easily erected at convenient distances in a sugar-cane tract, so as to ensure a regular and constant water-supply. At Nellikuppam and the surrounding areas, the use of oil engines for pumping water to sugar-cane fields is a common feature. The soil being workable, the construction of wells in this part of the District has presented no difficulties; and six to ten acres of land are being easily irrigated in a day by one of these small engines. The fear of failure of water-supply has been thus reduced to a minimum; and the expenditure too on the



II. A THREE ROLLER IRON MILL (S. ARCOT.)

sinking of the wells and the putting up of the engine pumps is more than compensated by the unusually good crop.

Lastly we come to the inferior methods of extracting sugar. At present a large number of ryots are using the three Roller Iron Mills which are worked by a pair of cattle as shown in the illustration. These are no doubt an improvement on the old wooden mills, but are still unsatisfactory inasmuch as a large percentage of cane juice is left unexpressed. This is a clear waste which can be avoided only by the use of power-driven mills. "Each of these at Pre-war prices cost about Rs. 12,000, and is capable of dealing with 100 acres of good cane in a season. Roughly of the sugar consumed in India, three-fourths is grown in the country and one-fourth is imported. Roughly also, of that grown in the country one-third is wasted owing to the inefficiency of the primitive methods of extraction. Nearly one-half of this loss might easily be avoided, and if it were, the profits of cane cultivation would be greatly increased." (Report of the Indian Industrial Commission.)

In South Arcot there are two powerful steam mills which together crush all the sugar-cane grown in the eastern cane-tract of the district. The increase in the yield of sugar and the quality of the juice expressed have already opened the eyes of the Indian ryots, but want of capital stares them in the face. A rich Indian farmer with commendable enterprise installed on his estate in this District a small power-driven plant which, however, is not a growing concern today, chiefly because of the great factory at Nellikuppam.

But this failure should not be considered seriously. There is no doubt that the use of power-driven machinery in the extraction of cane-juice and in the making of sugar will increase the yield by at least ten per cent. The success of the large factory at Nellikuppam in recent years should once for all

dispel any doubt about the future of this industry, provided that modern machinery is employed. The Industries Commission say in their report "The universal adoption of power plants for cane crushing would cost about thirty crores of rupees: this expenditure would be justified by the consequent reduction of the present cost of cane-crushing and by the increased yield of sugar. The indirect gains to agriculture would also be of the highest importance. Large numbers of cattle, whose work must be equivalent to many hundreds of thousands, probably millions, of horse power, are employed in lifting water and crushing cane. It is hardly realised how heavy is the burden thus entailed upon the farmer's cattle and how severe the resulting deterioration of their working power for purposes of cultivation"

The Indian sugar-cane Industry has, therefore, a great future if the improvements suggested above can be speedily effected. Here is a great field for Co-operative work being immediately undertaken under the auspices of the Government.

One of the noteworthy consequences of the war, according to *Metall und Erz*, is the great increase in the output of wolfram. Before the war the whole world-production did not exceed 10,000 tons annually. The present output is at least double that quantity. An approximate estimate gives: Portugal, Spain, France, and Great Britain, 2,500 to 2,800 tons; North America, 6,000 tons; South America, 3,000 to 3,500 tons; India, Siam, the Malay States, and Australia, 5,500 to 6,000 tons; China and Japan, with Indo-China, 800 to 1,200 tons. The stimulus has been high prices, so that a drop in market value would close some of the mines. Russia certainly possesses deposits of wolfram. South America, Spain, and some countries favourable to Germany may be expected to ship to her wolfram ore at prices considerably below the present abnormally high level.

CO-OPERATION IN MYSORE,

1917-18.

BY "RUSTICUS."

THE days are now past when converts to co-operation, as to Christianity in early days, come in their legions. It is just as well for many of them bore the burden of the new faith very lightly and were a source of weakness rather than of strength. Mysore is no exception to the rule which has been general throughout India that progress in the future must be slower and more sure than it has been in the past. In 1917-18, the number of societies increased from 974 to 1,097 or by 12.6 per cent, their membership from 74,906 to 81,168 or by 9 per cent and the working capital from Rs. 57½ lakhs to Rs. 65 lakhs or by 13 per cent. This rate of expansion is sufficiently rapid. It is satisfactory to see that the staff of the Department, both superior and subordinate, is being increased. The Deputy Registrar is to be replaced by two Assistant Registrars. There is to be a third eventually when the agricultural and industrial side of co-operation has developed. We are inclined to think that it might have been better policy to appoint him at once in order to organize this side of the movement. The staff of inspectors and clerks have been considerably strengthened and will now expand automatically with the increase in societies.

The report contains many interesting statistics but it does not give the figures, which our readers will have gathered from previous articles in these series we regard as the acid "acid test" (to use a phrase which is now very much in fashion) of the soundness of the movement—those showing the percentage of the loans made by central banks or primary societies which is overdue. Such information as is given on this head entirely bears out the view of the Government of Mysore that the outstandings are heavy in

all districts and that there is need for the adoption of special measures for recovering the arrears and enforcing punctuality in repayment. We trust that the omission will be rectified in future Reports.

The measures taken during the year to improve the working of unsatisfactory societies, which consisted in the expulsion of delinquent members, the filing of suits against confirmed defaulters, and, generally of waking of the committees of management to a sense of their duties appear to have been distinctly effective judging from the changes in the classification of the societies. In the previous year, 401 societies were considered good, 327 fair, and 132 bad. In 1917-18, 593 were classified as good, 240 as fair and 124 as bad. These figures would convey more information if some idea were given of the conditions a society is required to satisfy before it is placed in the "good" or "very good" class. At present the outsider has no means of judging whether the standard is a high one or not.

There is little in the working of central institutions or of primary societies for purposes of credit which calls for comment. We regret to see that no progress was made in regard to the amalgamation of the Bangalore Central Co-operative Bank and the Mysore Provincial Co-operative Bank into a State Co-operative Bank. The Shimoga District now shares with the Mysore District the distinction of having a District Central Bank. The Registrar Mr. Ranga Rao is not very hopeful of the future of the Federal Banking Unions. He points out that the sphere of their operations is either too large or too small. It is too large in that they are not in sufficiently close touch with their clientele as are primary societies and it is too small as operations which cover only a single *taluk* prevent them from being really effective banking institutions. The advantages they undoubtedly possess in the matter of supervision have so far been nullified by the difficulty in procuring competent Supervisors

on the meagre pay which is all they can afford. Mr. Ranga Rao therefore recommends that the more promising of them should be converted into District Banks.

As for societies for purposes other than credit the Mysore Co-operative Department like that of Bengal is paying special attention to weavers societies. There are now twenty-six of these and their transactions are by no means negligible, their purchases of yarn and other goods amounting in 1917-18 to Rs. 2.90 lakhs and their sales to Rs. 3.06 lakhs. It is very uphill work doing anything for weavers owing to their ignorance, illiteracy and general backwardness. Societies have now been started not only to provide them with credit but also to supply them with yarn, looms, dyes and other necessities for their work and to find them a market for the produce of their looms. That the Government of Mysore regard work amongst this class of the population with special sympathy is shown by the fact that they have recently sanctioned a special loan of Rs. 50,000 to the Weavers Co-operative Society in Bangalore to enable it to tide over the difficulties arising from the instability of the cloth and yarn market.

Of the ten societies for jaggary manufacturing and rice hulling, three of the jaggary societies worked for part of the year and one rice hulling society was engaged in putting up its plant. None of the other societies showed any signs of activity. The Registrar says that the working of the societies is still in the experimental state but if no work at all is being done, it is difficult to see in what the experiment consists. Surely it is time these societies were galvanized into life or wound up. Of the two lift irrigation societies one has paid back the loan of Rs. 3,000 due to the Industrial Department on account of the machinery purchased on its behalf and is now, therefore, firmly established. The other is waiting to buy its

machinery under peace conditions and in the meantime is doing ordinary credit work.

We are especially glad to see that the number of societies for the depressed classes increased from seven to sixteen and that many of the existing societies are admitting persons belonging to these classes to their membership. There is no worthier field for co-operative activity than in improving the condition of these classes.

In our opinion the most interesting feature of the Report is the all too brief paragraph summarising the results of the investigation into the economic conditions of the members of co-operative societies. These results are so important that we need offer no apology for dealing with them at some length. In 1916-17, an investigation of a rather rough and ready order which extended to about fifty societies showed "that the indebtedness of the members had not decreased, that the grip of the sowcar on the ryot had not been appreciably relaxed and that, beyond conferring some little benefits, co-operative societies had not materially improved the economic conditions of their members." The survey carried out in 1917-18 was on a much larger scale. It covered 180 societies, the operations of which extended from 700 to 750 villages with about 1,00,000, houses the total population of the villages was about 5,00,000 of whom 13,200 were members of co-operative societies. Of these 5,000 had no debts of any kind when they joined their societies and have incurred none since. They were left out of the investigation. The proportion of members of the societies who were not in debt is suprisingly high and it would seem either that the societies whose operations came under investigation were particularly successful in attracting the best elements of the rural population or that the Indian ryot is more thrifty than he is usually given credit for. The indebtedness of the remaining 8,200 members at the time they joined their

societies amounted to Rs. 20,21,400 and their assets to Rs. 91,32,000. Their total indebtedness at the time of the investigation was Rs. 21,97,000 of which Rs. 10,50,000 were due to their societies and Rs. 11,47,000 to money lenders. Their total indebtedness had thus increased by about $1\frac{3}{4}$ lakhs but their total assets had increased by nearly Rs. 16 lakhs to Rs. 10,713,000. The Registrar considers these figures not unsatisfactory. He lays stress upon the fact that, although the amount of the indebtedness of the persons examined remained practically the same, the conditions attaching to that indebtedness altered materially for the better. Nearly half the money due to the money lenders had been paid up and in place of the high interest and onerous conditions to which that debt was subject, a reasonable rate of interest and easy conditions of repayment were substituted. The men were also put in position of the means of carrying on their agricultural operations and increased their assets by Rs. 16 lakhs. For our own part, we consider the figures disappointing. The first object of co-operation is the reduction of indebtedness and the promotion of thrift and it is very disconcerting to find that indebtedness has actually increased and that, even now, the members of Co-operative Societies owe more to the money lenders than to their societies. On the credit side has to be placed the increase in the assets but we attach much less importance to this than to the figures of indebtedness for the reason that the valuation of assets is a much more difficult matter than the ascertainment of debt. We should have been glad to have been told on what principles it was carried out. Has the rise in prices in the last few years been taken into consideration? Were the assets of the members on joining their societies valued at the prices then prevailing or at the present level? If the former, the rise in prices in recent years is more than sufficient to account for the increase. Again, it would

have been interesting to know whether and, if so, what proportion of the members of the societies had entirely released themselves from their obligations to money lenders and how many of them still owed something to their societies and something to the sowcar. Has the sowcar made the terms for that part of the debt due to him more onerous? Endless questions of this character on which the economic enquirer would like light thrown could be asked. We trust that the results of the survey which it is proposed to complete for all the societies in the State will be published separately and that full details will be given of the manner in which it was carried out and of the qualifications of those to whom it was entrusted. If economic enquiries of this character are to yield information of real value, it is necessary that they should be carried out by trained men who are given careful instructions what to ask and how to ask it. Dr. Slater's enquiries in South India, Dr. Mann's in the Deccan and Mr. Jack's in the Faridpur District of Bengal are models of what such enquiries should be. But, notwithstanding the scantiness of our knowledge of the methods of the Mysore enquiry, we consider the results important and enlightening for it is obvious that if the investigators had any bias, it was in favour of co-operation. They have established that it has accomplished by no means as much as might have been expected and that Co-operators must apply their shoulders to the wheel of the Co-operation coach with redoubled energy, more especially in regard to freeing the members of societies from old debts. In this connexion, it is worthy of mention that the loans granted in 1917-18 for discharging prior debts amounted to Rs. 19 lakhs against Rs. 16 in the previous year.

Co-operation with special reference to agricultural and industrial development has yet to make a real beginning in Mysore. There are undoubtedly difficulties in the way. We do not know whether there are any

which are special to Mysore but from the Registrar's statement that he has suggested co-ordination of the efforts of the Department of Agriculture, the Department of Industries and Commerce, the Economic Conference, and the Co-operative Department, it would seem that one great difficulty is that too many departments are concerned. Societies have now, however, been started for the supply of seed, of manure and of implements as well as societies for artisans of different kinds so that in the next Report, there should be some substantial progress to record.

It only remains to add that the Government Review of the Report is full of helpful and stimulating criticism which in itself is evidence of that keen interest displayed by the highest authorities of the State in the welfare of the movement which is mentioned by the Registrar in the body of the Report and augurs well for the future of Co-operation in Mysore.

According to a letter formulated by the World Trade Club advocating universal adoption of the metric system, the present coinage of the British Isles, as well as the weights and measures of both the British Isles and of America, is German. The British pound, both sterling and avoirdupois, originated with the old German Osterling Hanseatic League, which for hundreds of years controlled the trade of England. What is still more remarkable is that America and Britannia continue to use these old German tools after Germany herself has forgotten them. The latter country adopted in 1871 the simplest decimal system of quantity expression known—the application of the decimal to weights and measures, the invention of that truly great Briton, James Watt, in 1783.

THE PERIYAR IRRIGATION SCHEME.

BY PROF. ALBERT J. SAUNDERS,
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IT is reported of the Great Alexander that he wept when he thought that there were no more countries which he could conquer. The world war of 1914-18 has ended, and we all hope that before long a lasting and just peace may be secured for the world. But peace no less than war will bring with it tremendous problems and responsibilities of reconstruction. There are still other worlds to conquer, as the air, water, and, a greater production from the soil. One has only to read the leading Economic Journals, and publications like *The Times Trade Supplement* to realise the difficulties involved and to learn of some of the suggestions already made to meet the needs of this new era. There is one thing about which all are agreed, and that is the great need for increased production throughout the world.

I

India will have a part—and a large part,—to play in meeting the urgent demands of an impoverished world, not only in agriculture, but also in manufactures. Next to capital, India's greatest need for industrial development is the question of power. We have often heard and read the relative advantages and disadvantages of steam-power and water-power as they relate in India, and it is a question of vital importance to Indian industry. The general opinion of those who have given much thought to this matter is that India can have and must have an industry driven by water-power. Referring to the industrial development in India, in the course of a recent address to the members of the Eighty Club, Mr. Alfred Dickinson, the

well-known Engineer, who was responsible for carrying out the huge works and dams for supplying Bombay with electricity, pointed out that the price of coal, not only in India, but throughout the world, was rising faster than the interest on capital was rising. Therefore, the disparity in the capital cost between water-power and a steam-power development was rather tending in favour of water-power. Cheap water-power for India, Mr. Dickinson said, was no idle dream. Messrs. Tata, of Bombay had been the pioneers, and recent investigations made were of the highest importance to the whole of the East. It had been discovered, for instance, that by constructing a dam across the valley in the Western Ghats, water could be harnessed so as to provide 300,000 horse-power every hour in the year. Mr. Joyner, who has been associated with the Tata Hydro-electric works since their inception says, "We can produce enormous quantities of water-power and not only that but the water giving such power will increase the food supply, ensure the growth of materials for industrial products, provide the fertilizers and the light, reduce the possibilities of famine, and allow the populations to be less dependent upon agriculture and the uncertainties and so help the general ease and contentment of the country." Some of my readers will also remember the interesting suggestions in this connection made by Prof. H. Stanley Jevons of Allahabad in reference to utilising the waters of the Ganges system in North India.

To show the importance which is being attached to the question of utilising water-power, especially in the British Empire, I may refer to the report recently issued by the Water-power Committee of the Conjoint Board of Scientific Inventions. This body was appointed to ascertain the possibilities and distribution of water-power in the British Empire, and to report on what is at present being done and what may be done in the future. It has recently issued its first report,

and its conclusions are very important and interesting.

Among other things, the report has said that—according to its calculations the power at present being used throughout the world is 120 million horse-power. Of this amount, 75 million horse-power is used for factories and of the 75 million, the United Kingdom claims 13 millions, Continental Europe 24 millions, the United States, 29 millions, the British Dominions and Dependencies, 6 millions, and Asia and South America, 3 millions. Between 15 and 16 millions of the world's industrial horse-power, is at present developed from hydraulic resources, and here the United Kingdom is the most backward of all the countries, listed, with the exception of Russia, its 8.3 per cent comparing very unfavourably with the 43.3 per cent of Germany. The Committee estimate that the potential water-power of the Empire amounts to at least 50 to 70 million horse-power and they believe that much of this is capable of immediate economic development. They suggest that the development of such enormous possibilities should not be left to chance, but should be carried out under the guidance of some competent authority. They further propose that the Government should take steps to form an Imperial Board of Commission to include representatives of all the Dominions and Dependencies to investigate the matter, and advise the State as to developments which it might assist or initiate. It is unnecessary to point out the direct interest that India has in this question. Probably in no part of the British Empire, excepting perhaps, Canada, are the potential water resources more extensive and promising. In this very connection it is interesting to know that the Government of India have already appointed a committee to undertake preliminary investigations with a view to starting a systematic survey of water-power resources in India for the purpose of aiding industrial development.

As in the past, so in the future, as far as the British Commonwealth is concerned—

The future belongs to Water.

II.

THE PERIYAR WATER-SCHEME.

I wish to tell briefly the story of the Great South Indian Periyar Water-scheme. Over fifty years ago, Engineers in the Madras Presidency were observed with the idea of the possibility of catching and storing water in the Travancore Hills, and by means of channels and through the action of gravitation to distribute that water to the hot and thirsty plains of the Madura District. Investigations were undertaken, several experts made tests and trials, the scheme was pronounced feasible by the best advice obtainable, and then plans were drawn up and negotiations entered into for the prosecution of the work. The first great difficulty was obtaining sanction from the Government of Travancore (a Native State) to proceed with the scheme. The proposal was in past, to rob and direct a large water-supply in a Native State to feed and irrigate a district in British India. The Periyar River fed by many other smaller streams flowed westward from the hills for a distance of about sixty miles to the sea, and irrigated sections of Travancore lands on its way. It was not a large scheme; it was simply natural irrigation from a mountain stream; the Government had put very little money into the concern, and so its retention was not a great benefit and an absolute necessity to a great population of people, nor, on the other hand, would the diversion of the water be unspeakable hardship to the people concerned. It was the simple question of utilising to the greatest good the water available—the greatest good to the greatest number. The old Travancore scheme was a small affair, benefiting a comparatively few people. The new Madras Government scheme would involve lakhs of rupees, it would store and utilise millions of tons of water, and give benefit to thousands upon thousands of needy

people. The Government of Travancore were unwilling for some time to grant permission to this deviation of its water-supply. But at last they did the magnanimous thing, and allowed the Travancore Periyar water-supply to be diverted for the greater benefit of ryots in British India. The works designed and executed under the direction of Colonel John Pennycuik of the Royal Engineers and afterwards Chief Engineer of the Public Works Department during the administration of Barons-Connemara (1886), and Wenlock (1891), Governors of Madras.

The Travancore Hills where the Periyar Lake is situated lie to the South of the Palni Hills, and just on the border between the State of Travancore and the District of Madura in South India. There is a wide and well-kept ghat road from the Cumbam Valley over the hills, which runs close by the outlet of the lake. The journey up the ghat road to Tekkadi (altitude about 3,000 feet)—the outlet of Periyar, is very interesting. As we neared the summit of the hills, the road led us over a wild, rushing, mountain torrent. The water here comes down in thousands upon thousands of tons. It was the Periyar let loose with miles of water behind giving it an irresistible momentum. The sight was one of the most beautiful I have ever seen—falling water in its wildest ecstasy, with the voice of thunder, tremendous power, but wasted energy. From an Engineer's point of view, it was a sad waste of potential power which might be utilised to generate electricity, supplying light and energy to a score of large towns, and enabling the city of Madura to become a great industrial centre. The water from the lake passes through a tunnel cut through a mountain one and one-eighth miles in length. We went to see where the water rushes out the mountain's side. The tunnel is $13\frac{1}{2}$ by 7 feet, from which issues a great body of water, and as it leaves the weir, which is constructed just before the tunnel,

measures seventy feet by two feet of water per second. That water flows down to the hot and thirsty plains and irrigates thousands of square miles of land, enabling the desert place to become an oasis of life and plenty. It is just there at the weir that a large water wheel or turbine might be set up to translate that water-power into electrical energy, which then could easily be distributed to a number of centres within a radius of one hundred miles. This is no idle dream; it is within the realm of possibility. In fact such a scheme has already been projected. Madura which is only about fifty miles distant as the current line would go, needs electric light, city tramways, and a supply of power for its factories. These could easily be furnished if the necessary electricity were generated by utilising the water-power of the Periyar Channel, which is now going absolutely to waste. 1919 was the year when a projected scheme for doing this very thing was to be put into operation. But unfortunately and like so many other important works, the great war came and this proposal has had to be abandoned, at least for the present. We sincerely hope, however, that it will not be many years before the Project will again be received and completed.

At Tekhadi is the outlet end of the Periyar Lake. The lake itself is twenty-one miles long, and is fed by seven rivers—the largest and most important of which is the Periyar. The source of these rivers is forty miles from the head of the lake. While the total area of catchment is estimated at 232,801 square miles. Fourteen miles from the head of the lake, and therefore seven miles from its outlet end, is situated the Dam, which is a huge stone and concrete wall built across a valley and uniting two hills and making possible the large storage lake. The dam is 1,200 feet in length, 158 feet high, width at the base 85 feet, and at the top 12 feet. The lake when full, which is usually about the beginning of December, after the rainy season, registers 152 feet of water at the

dam. When the water sinks to 132 feet the gates at the Head Sluice are closed, and distribution is stopped. So, there is therefore a thirty feet available supply of water from a lake twenty-one miles long by varying widths according to the arms of the lake. Should the water rise above 152 feet the flood-gates are opened and the water is allowed to escape through Travancore to the sea. The huge shutters are Stoney's Patent, and consist of ten spans. These are erected across a smaller valley a short distance from the dam. As I saw them in the light of the setting sun they were most picturesque, and, of course, far more interesting than the dam itself. The dam is leaking in several places, but nothing to cause any great alarm. The leaks are worse when the lake is full, and one cannot wonder much at that when he thinks of the tremendous pressure of those miles of water which the dam has to bear. Great care, however, is taken to watch those leaks. Tests are taken every month and sent to the Government Chemist in Madras for analysis. Two samples of water are taken one from the river water at the head of the lake, the other from the leak in the dam, and the test consists in seeing whether there is much lime in the one as compared with the other. If there is very little lime it shows that the leak is not serious, but if a large quantity of lime is coming through, then it means that the dam is being saturated, and the leak may soon become dangerous.

The dam took seven years to construct. The water scheme was opened in 1895. The water flows to the plains for nine months in the year, from June until March, and irrigates lands for a distance of 130 miles. The Periyar is the largest reservoir water scheme in India, and the capital outlay was over £ 700,000, or over 105 lakhs of rupees. There was no great engineering difficulty to overcome in this undertaking. It was simply the construction of a huge dam to connect two hills, and thus make a

reservoir capable of storing a great quantity of water. The altitude of the lake and the force of gravitation made the distribution of the water a simple matter. To help in this distribution large tanks or lagoons are situated all over the district, these are fed by the Periyar channel, and from them the water flows through smaller channels again to the rice fields. Many fields now produce

three crops a year, where formerly scarcely one was possible. The fertility of large sections of land in the Madura District has been enormously increased by this scheme.

III.

The accompanying statements will show the statistics of the scheme clearly.

THE PERIYAR SYSTEM.

Statement showing the financial results of the Periyar Irrigation works for four years from 1912-13 to 1915-16, in rupees.

Name of works.	Year	Mileage in operation		Estimated cost of construction (direct and indirect)	Date of construction of work (P. W. Code II 1918)	Date when system came into operation	Total capital outlay (direct and indirect)	Accumulated arrears of interest	Accumulated surplus Revenues
		Main canals and branches	Distributaries						
1	2	3	4	5	6a	6b	7	8	9
Periyar system.	1912-13 ...	139	139	1,06,31,523	1896-97	1896-97	1,05,25,017	17,90,002	...
		*	*						
	1913-14 ...	103	106	1,06,48,949	...	...	1,05,70,165	17,30,841	...
	1914-15 ...	103	106	1,06,56,559	...	...	1,06,17,349	16,41,359	...
	1915-16 ...	103	106	1,06,63,917	...	...	1,06,47,402	15,37,383	...
	*Arrived at an actual measurement.						£709,800		

THE PERIYAR SYSTEM—*Contd.*

Financial Results of the year.

Total sum of charge (Col. 7—8)	Gross receipts (direct and indirect)	Working expenses (direct and in direct)	Net revenue	Per cent on capital out- lay. Col. 7	Per cent on sum of charge. Col. 10	Interest at 3½ p. c. on direct capital outlay to end of previous year plus half the out- lay of the year.	Net profit	Net loss	Per cent of working ex- penses to receipts (Col. 11—12)
10	11	12	13	14	15	16	17	18	19
1,23,15,019	6,05,628	1,79,127	4,26,501	4.05	3.46	3,55,316	71,185	...	29.58
1,23,01,006	6,02,055	1,97,887	4,04,168	3.82	3.29	3,45,007	59,161	...	32.87
1,22,58,708	5,97,799	1,50,390	4,47,409	4.21	3.65	3,57,927	89,482	...	25.16
1,21,84,785	6,22,797	1,62,311	4,60,486	4.32	3.78	3,56,510	1,03,976	...	26.06

The Periyar is the largest in India.

It irrigates approximately 130,000 acres of which about 40,000 grow two crops yearly.

Submitted by the Executive Engineer, Madura, Division, Feb. 14, 1917.

The Periyar Water Scheme may serve two purposes. It has been shown that it may be used as the water-power for the purpose of generating electricity for industrial uses. But it was designed for an irrigation scheme, and that must ever remain its primary function. Its value as an economic asset is great. Lands which formerly had difficulty in raising one crop of paddy in a year now produce two, and sometimes three crops in a year. One has only to visit such villages as Sholavandhan and Melur to see the great advantage which this assured water-supply has conferred upon these important centres. A visit to Sholavandhan sometime ago for the purpose of investigating economic conditions revealed some important facts. It is the leading village of a large Union, situated on the main railway line thirteen miles from Madura. It has the advantages of the Periyar Water-scheme, which have made it a

veritable garden. The Vaigai River which adds to its water-supply in the rainy season is close by, hills are near, and the whole landscape gives the impression of peace and plenty. All castes are represented, there are 722 homesteads and a population of 4,385 including 600 panchamas. It is all practically wet land cultivation consisting of 1,700 acres. 700 acres are cultivated by the land-owners themselves, while 1,000 acres are tilled by servants on the usual conditions obtaining in that section. The Government land revenue amounts to Rs. 14,000 per year, averaging about Rs. 9 per acre. Paddy, of course, is the principal crop, making for the most part two crops a year; betel leaf, cocoanut and plantain production is also followed. A water cess of Rs. 4 per acre per year is charged. Manures and green leaves are quite widely used, averaging 25 cart loads per acre. Cattle dung is mostly used for fuel in the village. The total cost of cultivation per acre is Rs. 40. The people of this village are ambitious for progress. They are experimenting with their agricultural methods, such as—single

seedling, transplanting, better seed and better stock. The coming of the water scheme has meant a great deal to this village and the surrounding country.

Here is a typical family budget of one—Vellachamy Ambalam. Land-owner. Cultivates his own lands. He has eighteen acres. Owns a house and a cattle shed. He has two wives and two children and one servant. He has ten bulls, one cow, four buffaloes and four ploughs.

Income.	Rs.	A.	P.
140 Kalams of Paddy, realising in a year about	770	0	0
Expenditure.			
Agricultural expenses	200	0	0
Food bought	120	0	0
Clothing	50	0	0
Taxes	157	8	0
Servant	50	0	0
Other expenses	100	0	0
Total	677	8	0

Balance—so that this man is able to save about Rs. 100 a year, which is invested in more lands.

At Melur I learned of the real reformation of a criminal tribe because of the water scheme. All through that countryside there lived a notorious criminal tribe of Kallars. They are professional robbers. At certain seasons of the year they would go out in bands, hold up people and steal from them on the public roads, snatch jewel from women, steal cattle, and were the terror of the community. It is said that in July, which is the marriage season before a young man can have a girl for a wife he must demonstrate his bravery and fitness by stealing something of value from some one, and present it to the girl. But now, all is changed, since the coming of the Government Irrigation water scheme these kallars have been so busy cultivating their lands and doing so well as good and law abiding farmers that they have altogether ceased their old robbing profession, and are now a respectable and prosperous community.

The future of India depends upon the development of her water utilities. Water, of course, is absolutely essential to her agriculture, but water-power must also be employed as largely as possible for the development of her industries.

The future of India belongs to water.

FOREST RESOURCES.

By P. S. GOVINDA RAO,

District Forest Officer, Kadur District.

THERE are few subjects so closely connected with the wants of society, the general health of the people, the salubrity of our climate, the production of our soil and the increase of our national wealth as our forests; and still fewer are the subjects to which our country is paying so little attention. It may, therefore, be stated, without fear of contradiction, that outside of food products, no material is so universally used and so indispensable in human economy as wood. Indeed civilization is inconceivable without an abundance of timber (*i.e.*, the chief product of our forest).

The evils of the past destruction of the forests are already manifold and the circumstances in which our country is now placed add an increased tendency for the multiplication of these evils. The evils of the past destruction are, at present, comparatively but few, when we think of the future large wants of our country. Tree growth is slow and normal restoration of forests tedious, though very interesting and all absorbing to forest man, while destruction is rapid and injury practically instantaneous. Delay, therefore, in combating the evils of the situation will be but adding to the difficulties; consequently, I beg to draw attention to this subject of *Forests*, the importance of which ought to be self-evident to all.

The cost of fuel in our towns has increased more than four-fold what it was a decade ago; while in villages and hamlets, especially in maidan and arid tracts, the supply of fuel has been reduced to next to nothing. The Railways and Steam-engines exhaust an enormous quantity of fuel and timber. Consequently the outcry for the same is

perpetually on the increase while the sources for supply are permanently on the decrease (to the consternation of the forester who finds his legs pulled and is impotent to conserve and to meet the normal supply). The timber has had equally its own share of scarcity, especially teak and valuable kinds, and the cost has increased in geometrical progression. Taking India as a whole, the 36,286 miles of the railways in it and 643 miles in Mysore which both for the dimensions and needs of our country, are nothing when compared to the lines of the foreign countries like England, United States, France and Germany, consume on an average 15,000,000 rupees' worth of wood for their sleepers, while nearly half that sum might be allotted for each year for the buildings attached to the Railway Department.

India.		Miles.
Broad Gauge	...	18,182
Metre	...	14,806
Narrow	...	3,298
Total		36,286

Mysore.		Miles.
Narrow Gauge	...	513
Metre	...	103
Tramway	...	27
Total		643

The increase of knowledge or comforts of the progress of civilization 'whatever it may be called' among the inhabitants of our country has produced new fashions of buildings to which the rise of population following its law of perpetual growth, adds its own weight and want. The scarcity of wood and timber is attended with the scarcity and high value of the houses and materials constructed of wood, and pushes up the fares and freights for the use of such houses or materials. This is known to one and all of

the high and middle classes and requires no further elucidation.

The evils of these consequences descend at once upon the labouring and poor classes of the inhabitants of the country, who suffer from want of lodgings and from the inclemencies of weather and are obliged to live upon uncooked food and to forego the advantages of peace of mind, good education, and sound health. Their whole earnings cannot procure them any of the partial comforts of life, while their children, which are generally many, multiply those miseries. While so, many evils are immediately caused by the destruction of forests and severely by the men of the country. The destruction of Forests does not stop but shall continue to go on with increased rapidity; and no healthy steps whatever, from forest point of view, have been earnestly taken in the way of conserving the state of our District Forests, which contain not a little of excellent timber and good fuel but also form almost the whole of sandal resource. Every day the Railways are extended. Every day enormous buildings raise up, every day tenders for timber are invited and offered, all at the expense of our ever thinning forests; yet no encouraging word or no serious thought of an energetic step in the direction of conserving or restoring forests is spoken or felt by the people of the country. On the other hand the reverse is ever conceived and harped on in and out of season to the disadvantage of the general public, and to the jeopardy of coming generation. The villages which only within the last ten or twenty years were girt with rings of trees, covering underneath many acres of land, can see now nothing around them but arid plains surrounding the sun-scorched fields, and clods-cleft tanks. The villages that within a few years were depending upon the fellings of their trees for fuels and implements, scarcely now possess a bush, that might be cut and used for a cow's post: while the animal manures which ought to go to improve the soils, are dried

as bratties and appropriated by men to cook rice for them, while they should be better employed for cooking the food for the rice itself.

While the denudation of forest growth in District Forest is continued without let or hinderance, the needs for forests in Mysore and their conservancy are cried down when they are to be too many and must be multiplying in hundred other ways on account of fostering industries and industrial concerns which are the order of the day to indicate the progress and prosperity of the country.

I have already said that the Railway lines consume, on an average 15 millions of rupees per annum for mere sleepers. This sum, perhaps, is open to objection as enormous if I do not show that it may be taken only as the minimum estimate. For every mile of Railways, are laid down 2,000 sleepers which need to be renewed every ten years; for each year thus the sleepers consumed for every mile of Railway amount to 200 sleepers on the average. Supposing that the sleepers cost at the lowest now Rs. 200 per 100 sleepers, the 200 sleepers consumed every year for a mile cost Rs. 400. Thus the entire length of Railways take up for the sleepers alone Rs. 14,771,600, or in rough figure 15,000,000, rupees worth of wood, speaking nothing of wood required for the future laying of new lines.

Again for fuel, the Railways cost a great amount. It is true many Railways use coal at present. But coal forms a resource exhaustable and non-restorable. Scientific authorities say that the supply of coal in Europe is calculated to last not more than three centuries, although scarcity will have to be expected long before that time. In America anthracite coal is said not to last more than 50 or 60 years under the present methods of working. With such specific authoritative assertions, the coal restriction regulation for industries and naval engines only, may, any day, be passed suddenly after

the peace treaty is concluded, when Railway steam-engines will have to depend entirely on forest fuel alone. Then, the demand for fuel will assume such large dimensions that, then, even thin rocky soils of mountain Districts, which are worked now for scanty agricultural crop, will have to be appropriated for growing fuel on through sheer necessity. A Railway friend of mine informed me in all seriousness, that the annual consumption of fuel by Railway in India amounted to Rs. 3,000,000, some years ago. It must have now increased considerably.

The other requisites of the Railways, bridges, tunnels, stations, houses, carriages, etc., may be estimated as amounting annually to at least Rupees 5 millions worth in wood and timber.

Leaving Railways in this State, let me come to the wants of the people individually. The recent census counts the population of India nearly to 350 millions. Supposing that on the average a family consists of five members and that a house of average accommodation for each family consume for its building Rs. 300 worth of timber materials and that these materials are sound for 40 years at the end of which they require to be renewed, the average estimate of the need of the house materials in one year will amount to Rs. 515 millions.

The housing being taken as Rs. 515 millions, the average cost of fuel requisites can be, at the lowest, estimated as rupee one per head of inhabitants per annum, which amounts to Rs. 350 millions.

Again, the wood and timber used by the artsmen such as carpenters, chair makers, sawyers and coach makers and for mines, factories and telegraph posts, etc., are factors for which value in rupees, annas, and pies cannot be got at for want of proper data. My forest school Director once said that "*civilization is built on wood. From the cradle to the coffin in some shape or*

other it surrounds us as a convenience or necessity."

What I have said so far is sufficient to show, I believe, how important it is for a country, to possess forests. Much more then is the importance of forests to our country where coal is scarce or is not discovered to exist in abundance and the probability is that we may not have even partially to supply the enormous requirements of this country. Before I end the subject of Forests as timber, wood and fuel producers, let me quote a beautiful passage from the *Economics of Forestry* on the point.

"The forest furnishes the cooperage to market our vintage, to store our flour and fruit. The forest furnishes the plough handle and harrow frame to cultivate, the threshing machine and wind mill to prepare the crops, the cart to bring them to market, the bottoms in which they cross the ocean to foreign marts and even the tar and pitch needed to keep the cargo safe. While iron ships have largely replaced the wooden bottoms in ocean travel, our coastwise and inland shipping, which requires a tonnage twice as large as the trans-Atlantic trade, is carried mostly in wooden ships. We rock in wooden cradles, play with wooden toys, sit on wooden chairs and benches, eat from wooden tables, use wooden desks, chests, trunks, are entertained by music from wooden instruments, enlightened by information printed on wooden papers with black ink made from wood, and even eat our salads seasoned with vinegar made from wood. The uses of wood, multifarious now, are constantly increasing. With the manufacture of wood pulp for cellulose an entirely new direction of use has been opened: originally designed to furnish a cheap substitute for linen paper, its application in many ways is growing daily, and promises for the future the largest drain on our forest resources, the manufacture of

wood pulp having increased more than three-fold in the last ten years."

Thus far I have dealt with the major produce, i.e., timber and fuel of forests. You know that forest is the chief store-house of minor forest produce which forms such an important part of industries and industrial concerns. The details of this part of the forest resource I have studiously omitted to shorten this note as everyone knows what they and their uses are, such as tanning materials, gums, resins, fibers, vegetable dyes, lac, oils, honey, wax, roots, rhizomes, grasses, medicinal herbs, etc.

Among other important factors of forests may be mentioned

1. Their influence on the precipitation of rain and the formation of springs.
2. Their influence on the climate of the country.
3. Their influence on the conditions of the soil and thus on the production of increased food-stuffs.
4. Their influence on the maintenance of rivers by the conservancy of catchment areas.

(1) Trees and forests cause, rather contribute to, the formation of springs and water-courses by means of the humidity which they produce or bring about and the obstacles which they present to the evaporation of water in the soil itself and by means of the roots that divide the soil like so many perforations and render it more permeable and facilitate filtration.

The following extract from Mr. Benson's report will amplify this factor of influence better than I can describe. "It is certain that the clearance of forests and the consequent drying up or draining of marshes and bogs have caused a material alteration, not only in the entire surface of the country, but in the supply of water to the rivers formerly derived from these reservoirs and in

the periodical amount of rainfall and the regularity of its distribution. Many streams, throughout the country, which formerly supplied large mills with unfailing water-power, except in the very driest of seasons, are now with vastly improved machinery requiring less power frequently unable to work and almost all are compelled to be supplemented by steam power to make good the deficiency.

The wolf spring in the commune of Soubey in France furnishes a remarkable instance of the influence of wood upon springs. A few years ago this spring did not exist. At the place where it now rises a small thread of water was observed after very long rains but the stream disappeared with the rains. The spot is in the middle of a very deep pasture inclining to the south. Eighty years ago the owner of the land perceiving that some firs were shooting up in the upper part of it, determined to let them grow and they soon formed a flourishing grove. As soon as they were well grown, a fine spring appeared in place of the occasional rill and furnished abundant water in the longest drought. For forty or fifty years this spring was considered the best in Clos-du-Doubs. A few years since the grove was felled and the ground turned again into a pasture. The spring disappeared with the wood and is now as dry as it was ninety years ago."

A well-known writer says: "Homer calls the mountain woodlands the habitations of the Gods, in which the mortals never fell the trees, but where they fall from age when their time has come. His tree and woodland nymphs, originating in springs, seem to suggest the suspected relation of forests and springs. The legend of Erichthonios most beautifully hints at the dependence of agriculture and forest cover: when by the fellings of a holy oak, he has offended the dryads, Ceres, the patronness of agriculture, is asked to send one of their number to the mountains of the Camasus to fetch Famine

who takes hold of Erichthonios and kills him."

(2) The forest vegetation about the country generally influence the climate for the better. It makes the climate regular and uniform and preserves the regions under it from the extremes of temperature. It also regulates the distribution of water in countries situated under forests. It is said by eminent men that "Forest air is more free from Pathogenic Microbes. Especially those bacilli which develop in the soil, like the cholera, typhus, and yellow fever bacilli, find in the forest soil less favourable conditions for development, and owing to the absence of strong winds, are less apt to be carried into the air where they would be breathed by men. In fact, in the dense forest, where the variation of soil moisture is small and decomposing humous keeps the soil *acid* no pathogenic microbes have as yet been found."

(3) As regards their influence on the conditions of soil and thus on the production of the increased food stuffs, I may state that more trees means more manure and more food production of food crops. Trees and tree-growth have the power of binding the soil and thus they offer great protection from being washed away freely. The surface soil of the country, the soil within half a foot of the surface, is all that the country generally depends upon for its agriculture. In the absence of tree-growth or vegetation the accumulated rainfall rushes down with violence over the surface and washes off the friable loose soil with it and deposits all the rich and soft soil into tanks, ponds, and finally under the salt water of the sea through the flow of torrents and rivers into it. Thus many a costly built tank, major and minor, is silted to the woe of ryot and the ever increasing expenditure of the Department of Public Works budget by the destruction of tree-growth in the catchment *area*. The freshly laid open surface is devoid of active plant-food and

the requisite physical condition for the agricultural operations; while the existence of the same trees will afford additional manures to the soil in many ways. The sheddings of trees are decomposed and formed into active plant-food. The waters percolating through the soil under forests are likely to dissolve many ingredients useful for plant life and distribute them to the fields irrigated from that source. Trees again influence the external manure, cattle dung and by their being available for fuel.

(4) The conservancy of catchment areas in the interest of maintenance of rivers and non-silting up of tanks forms a very important subject on which volumes have been written and experiences noted. In lieu of my indulging on this point at length I would simply invite the readers' attention to the practical experiences noted on pages 39 to 53 in *Forestry in India* by Mr. B. Ribbentrop, C.I.E., late Inspector-General of Forests to the Government of India.

Having said so much upon the importance of forests to one's country's progress, let me mention some of the steps that must be taken for tree-growth of all kinds, their culture and preservation in our country. There is now an enormous area of land fit and available for growing forest fuel and minor forest produce yielding trees in both malnad and maidan Districts, omitting wooded District Forest areas for which my views of management are definite. But most of them are now lying unproductive, such as thousands and thousands of acres of land annually relinquished and hundreds of thousands of acres of *karab* lands both in plain and hill sides in many localities. Large areas around or near village sites which are but too often covered with a noxious and offensive growth of prickly pear and lantana, etc., which from the habits of the people become insanitary, pestiferous and dangerous by giving shelter to wild animals such as tiger, panther, hyenas, etc.

These lands might be far better occupied by groves of fruits or plantations of fuel trees or manure leaf producing plants.

When the lands are prepared for being brought under cultivation, under the present expansive system, instead of intensive cultivation system, the farmers very improvidently cut off all the trees standing on the land. They do not even think of keeping up the trees or leaving them unmolested on the edges of fields. The shrubs that may better serve as landmarks, if kept aside, for which kindness they will amply repay their benefactor with their sheddings, if not with fruits, they do not preserve.

In zones unfit for coffee growing, *darkhasts* are made for areas containing valuable trees for purely exploiting the valuable stock thereon and then relinquishing them. This unjustifiable profiteering in deciduous District Forest at the cost of Government should be prohibited. The liquidation of farm and inam debts is another cause of the destruction of trees; here first are felled the trees suitable for sawing, then those that can be hewn; the last for fire-wood and charcoal till at last the forest becomes crooked, weedy and composed of comparatively worthless trees and lantana.

The number of palm trees which are usually tapped for palm sugar in the Madras Presidency is estimated by the Department of Agriculture as 2,500,000, and the yield of jaggery (crude sugar) therefrom as 35,000 tons (of 2,240 lb.). The total palm-sugar production of India, writes the United States Consul at Madras, is stated to be about 300,000 tons, of which Bengal produces about 100,000 tons, valued at £480,000. India's total production of sugar, both from cane and palms, is somewhere about 3,000,000 tons per annum. The area under sugar-cane in Madras is less than 4 per cent of the total area in British India, the United Provinces being the great producing area.

INDIAN CURRENCY AND FINANCE.

BY C. GOPALA MENON,

Member, Madras Harbour Trust Board.

WHEN one goes through the reports of the Royal Commission or other documents relating to monetary affairs, it leaves the impression that currency questions in India have to be solved by custom more than anything else. It must be the case elsewhere also, but we would venture to suggest that the complicated problems of currency are so intricate that more than an amateur knowledge is needed to grasp the full situation. Few officials in India have made finance a study of his lifetime. Theory must be divorced from practice. A theorist once said that the rate of exchange had nothing to do with the exports of a country, but those who have actually spent their time in practical commerce would say how much the prices were affected by the rate of exchange, and what influence it had on the cultivation and exports of a country.

A RATIO OF EXCHANGE.

It has been our trouble since 1870 to arrive at a parity of exchange, *i.e.*, to find out a ratio at which the Indian rupee may be exchanged at any given time for the English sovereign. What the Government of India has all along been trying to find out is a stable exchange, at the desired level, for the adjustment of her international trade balance. After a severe trial of half a century and more, the Government of India on the advice of the Herschell Committee stuck firm to its proposal of a gold standard, and formulated such schemes as would effectively maintain the rate of exchange at 1s. 4d. There was a period when the rupee was equivalent to two shillings sterling, and the parity between gold and silver was safely maintained—ten

rupees and one sovereign always interchanged at par. The intrinsic value of the rupee has always been worth less than the official rate at which it was fixed, and from 17th May the Financial member of the Government of India has fixed its value at 1/8 a rupee. It is impossible for the outside public to know the intricacies of the currency problem. To a close observer of the Indian currency matters, the events since 1893, are nothing more than experiments carried out to suit the changing conditions of currency needed for a vast country like India. But the experiments did not satisfy the varying demands of internal or international commerce.

VARIOUS CURRENCY LEGISLATIONS.

In 1893, the mints were closed to the coinage of silver, and the Government undertook to issue to the public currency notes and silver rupees in exchange for the gold coins and bullions at the rate of 1s. 4d. the rupee, or 15 rupees to the £ sterling.

The Government at the same time, undertook to accept, in payment of sums due from the public, sovereigns and half-sovereigns at 15 rupees to the £ sterling.

Act of 1896 authorised an increase to 100,000,000 rupees—the amounts which may be invested in securities of the Government of India out of the coin and bullion received for currency notes. In 1891 the amount that could be so held had been fixed at 80,000,000 rupees, so this act released 20,000,000 silver rupees from the currency reserve, and replaced them by a corresponding amount in securities.

In 1897, Government undertook to receive at the reserve treasuries, sovereigns and half-sovereigns, and to issue rupees in exchange at the rate of 15 to the £ sterling.

Acts Nos. II and VIII of 1898, authorised the issue of notes in India against gold held in London by the Secretary of State for India as a reserve to secure the payment of such notes.

In 1898-9, the question of currency and finance was referred to a committee presided over by Sir Henry H. Fowler, M. P., and their investigation resulted in favour of gold being made a legal tender in India. By Act of 1899, sovereigns and half-sovereigns coined at any royal mint were declared legal tender in India at the rate of one sovereign for 15 rupees.

Acts of 1900 and of 1902 gave the Secretary of State power to purchase silver with the gold so deposited, and transmit it to India for coinage and also authorised the issue of notes in India against silver bullion held in England by the Secretary of State as a reserve to secure the payment of such notes.

Abnormal trade conditions in certain years disclosed the necessity for the supply of rupees and the strengthening of the rupee reserve. In times of adverse trade, provision has to be made for the withdrawal from circulation of any redundant rupees, to prevent a superfluity of currency. In order to meet this and other contingencies the "Gold Standard Reserve," was created. Into this reserve it was decided that the net profits on the coinage of the new rupees should be paid and these profits should not be treated as revenue.

CHAMBERLAIN COMMISSION.

Such in brief are the different currency legislations brought into effect until the Chamberlain Commission was appointed in 1913 to enquire into the location and management of the general balances of the Government of India, the sale in London of Council Bills and Transfers, the measures taken by the Indian Government and the Secretary of State for India in Council to maintain the exchange value of the rupee. This Commission came to the conclusion that the free circulation of gold in India is unnecessary on the ground that a gold standard has been firmly established without a gold currency, notwithstanding the fact that the Fowler Committee recommended

that the British sovereign should be made not only legal tender but should be freely circulated and that the Indian mints should be thrown open to the unrestricted coinage of gold. It is, indeed, regrettable that, after the introduction of a gold standard, which has been proved a success beyond doubt, the question of a free circulation of gold is considered unnecessary by the Chamberlain Commission. Sir James Begbie, however, added a minute of dissent to the commissioners report to the effect that the existence of a large amount of token currency is an undesirable thing to a country which so largely absorbs gold. This absorption of gold, he observed, is a clear indication of a keen desire on the part of the people for the use of gold as a currency and that steps must be taken to discourage the use of a token currency in the face of the established fact that gold is becoming popular for currency purposes.

CIRCULATION OF GOLD.

There was, however, some difficulty in freely circulating gold currency without the existence of a mint, but the European war, which followed a year after the Chamberlain Commission, put a stop to any attempt on the part of Government for establishing a Royal Mint and the Government had to deal with matters of exigency at the moment. In February, last year, on the advice of the Hon'ble Sir William Meyer, the Royal Proclamation establishing a branch of the Royal Mint was made, but the mint began the coinage of sovereigns only on the 16th of August last year.

There is, no doubt, that India has absorbed a large quantity of gold during the past four years, and this will continue as India is at present a great creditor country. For instance, India's trade balance for December, 1917, was fifty-one crores in its favour. For the period ending December, India had to get eleven crores from Japan, ten

crores from the United States, five from France, four from Italy, two from China, one from Persia, one from Turkey in Asia, two from South America, one from West Indies, nineteen from Egypt, five from Ceylon, and four crores from Australia. Such being her supplying capacity it is no wonder that India has absorbed so much gold being an unlimited tender and one possessing universal currency.

STERLING EXCHANGE AND VALUE OF SILVER.

To a close student of Indian Finance and Currency, the announcement of the Secretary of State raising the sterling exchange on the 17th instant did not come as a surprise. It was in April last year a Simla *communique* was issued that in view of the United States Government making provision for melting down 250 millions silver dollars into bullion and for the repurchase by the American Treasury of the Silver at the rate of one dollar an ounce, it was found necessary for the Secretary of State for India to sell telegraphic transfers at 1s. 6d. and deferred transfers and bills at 1s. 5 29/32d. It was also announced that a corresponding modification will be made in the rates payable for imported gold acquired by Government under Gold Import Act 22 of 1917, namely, sovereigns shipped to India hereafter will be paid for at Rs. 13-12-0 a sovereign and descriptions of gold at equivalent rates. The Government was obliged to do this for purchasing silver in the United States and sell the manufactured rupees at a reasonable price. It is unnecessary to go into the provisions of the American Silver Bill for the supply of this metal particularly to India and the consequent modifications of the provisions of Indian Paper Currency Act. The only important provision is that the silver purchased for India from the United States and in course of transit should be treated as part of the Paper Currency Reserve.

APPOINTMENT OF EXCHANGE COMMITTEE.

When the exchange per rupee was raised from 16d. to 18d., the importer had a distinct advantage of 12½ per cent. It was predicted in the London Exchange market in August last year, that the exchange would go up to 20d. if the price of silver continued to soar high. Silver has always been a depreciated currency and consequently the American Government had to protect their miners under the Bland, Sherman and Allison Acts and the consequent result was that there was a large accumulation of silver in the United States. In India, silver being still the currency for all transactions, the amount of silver rupees that had to be issued by Government was found to be so large, that the Government of India have to buy the large supply of silver lying idle in the vaults of the American Presidency. They have been melting down this silver and are selling it to the Secretary of State for India at the rate of 1 dollar per ounce. This is as matters stand and the price which the Secretary of State is obliged to pay for this silver will be more than the silver contained in the manufactured rupee. The Government of India finds it necessary to raise exchange in order to avoid a loss. This silver supply will be one of the important questions that will be brought up before the Exchange Committee in London, as also the extension of the Banking facilities and how best to find means to avoid the present hoarding habit in India. Nobody denies the existence of hoarding in India but it is a habit prevalent throughout the world. Facts go to show that the European countries have hoarded gold and silver not only during the period of war, and it is no use flinging this charge on Indians alone. Hoarding, of course, is a custom of the Indian inborn *post memorian hominum*. The saying is that "the gold dug up in South Africa is buried in South Asia." It is estimated that about 7,000,000 dollars in silver

are consumed in the United States for the purposes of arts and jewellery. How much gold must have been then hoarded!

BIMETALLISM.

Another matter that will be considered by the Committee is the invaluable services that will be rendered to a country by a highly organized and soundly conducted system of banking which would eradicate the custom of hoarding and cut at the root difficulty in its economic advancement. The system must be such as to lead the public to place implicit confidence in its methods. Half-hearted measures would do no good—a stern policy on the part of Government is needed. It has already been suggested in the London financial papers that India should go back to the mone-metallic silver. One of the strong exponents of this policy in India is our veteran authority on finance Sir D. E. Wacha, who has produced a mass of literature on the subject. One thing is a well known fact—no country in the world has a double standard now. Bimetallism has been rejected by all the nations of the world except India. We are still clinging to a system of Bimetallism and it is for the Committee to decide what should be our policy in the future, and which is the stable standard for this country, whether gold or silver.

ECONOMICS IN THE WEST.

Parliament of Industry.

London, May 14, 1919.—Slowly but surely we are turning from the troubled courses of the war to the paths of peace. There is much creaking of the machinery, there are many episodes which at other times would be disquieting but which we know to be a natural outcome of a period of unexampled strain and anxiety, and patience and temper are sorely tried by flagrant instances of official ineptitude. But on the whole there is progress—real progress—towards settled conditions. If we had not the evidence of our eyes in the revived congestion of the London streets due to commercial traffic and in the lively condition of the docks and the riverside we have before us the day to day figures of demobilisation which show how enormous is the number of men who have been absorbed into industry since the declaration of the armistice. British industry undoubtedly stands on sure foundations: probably it was never on sounder despite the unexampled sacrifices of the war. The country never had such magnificent equipment: at no time were its captains of industry more alert and enterprising. As for labour, even in that direction the clouds are dispersing. The statutory body of employers and employed which the Government has created to deal with industrial questions carries with it the germ of a great and successful idea. In effect it will be a Parliament of Industry speaking and acting authoritatively on all matters pertaining to industrial life. It has already got over the critical initial stage not merely without difficulty but with the most perfect harmony and good will, and it only remains for ministers to give it the right work to do for it to become a permanent and valued part of our constitution. Mr. Wilson is so impressed with the value of the system that he intends,

The Forest Products Laboratories at Madison, developed from "clabber" (casein) taken from the fine Wisconsin Jerseys a glue of remarkable adhesiveness. Woodblocks joined with it have held against ten days' soaking supplemented by twenty-four hours' boiling in water. The process is now available without cost of industry and enables any manufacturer of furniture to put together articles that will stand the test of any climate.

it is stated, to take measures to set up a similar body in the United States when he returns home.

It is by no means improbable and India in a day not very far distant may find it advisable to have her own Industrial Parliament on the British lines with necessary modifications. The country is not unfitted by its habits of thought to the assimilation of the ideas which underly the recent innovation. After all, the Industrial Committees are not materially different in conception and intention from the *Panchayets* of immemorial Indian antiquity. That special sections of the community should settle their own domestic affairs through the agency of their own people specially chosen for that purpose is, anyway, the soundest of ideals, and provided the general interests of the people are safeguarded there is no possible reason why the system should not work advantageously. I am not sufficiently acquainted with existing Indian conditions to say whether there is yet adequate intelligence amongst the artisan class of the factories to ensure the successful introduction of the Industrial Council system. But if I interpret aright some of the most recent developments in India I can perceive the danger of leaving the organization of the workers entirely to outsiders. Nothing would be more fatal to Indian Industrialism than to harness it to the political chariot. That way lies disorder, lack of credit, stagnation and possibly even death for some of the more delicate branches of industry. The true course for the Indian Industrialist is the promotion of the development of the country on perfectly independent lines. This does not mean, of course, that he is not to have an opinion of his own where political questions are concerned. All it implies is that he is not to mix up what have no relation to each other, and as he does not interfere with politicians to permit no politicians to interfere with him.

In connection with this question of the relation of Indian Industrialism to politics there was an interesting letter published in the *Times* recently from the pen of Mr. D. M. Wadia, who needs no introduction to my readers as one of the most successful captains of industry in Western India. Mr. Wadia states that he has always refrained from taking any active part in Indian politics, "for I hold," he says, "with strong conviction that industrial and social reforms are the only foundations upon which any satisfactory political advance can be based." It will be a bad day, the writer thinks, if labour is allowed to fall into the hands of the political extremists.

"Their pretended interest in industrial questions is a mere pose. They wish to draw Labour sympathy on their side, so as to use it for political ends whenever the occasion arises. Their so-called sympathy with the workers is used as a disguise for aims which are really subversive of the prosperity and general progress on which the economic future of India depends." Mr. Wadia is well aware that the conditions of Indian labour must be improved and he suggests housing as a matter which especially calls for reform. But he has no faith in violent courses. "The Government with the co-operation of the employers, must educate the workers for that is the foundation upon which continuous amelioration must rest." "By all means," he concludes, "ameliorate the lot of Indian labour. Make it more amenable to helpful influences; let the workers realise that they are human beings and not slaves or mere machines. But at the same time every measure that is taken must be weighed, measured and gauged in the scales of both common sense and statesmanship." Wise words these! Will they be listened to? Time will show; also it will reveal probably how mischievous for the progress of Indian industry has been the recent sinister association of the forces of disorder with the Indian working class.

UTILISATION OF X RAYS.

Great and beneficent work has been done in surgery in the past years of war by the utilisation of the power of X rays to bring to light hidden conditions of the bones. But it is by no means alone in the sphere of human improvement that the discovery has been turned to account. According to an interesting paper read by Sir Robert Hadfield at a joint meeting of the Faraday and Röntgen Societies recently the rays were extensively employed in locating defects in metal castings—defects, such as blowholes which could not be detected by external inspection and which may yet seriously impair the strength of the finished article. The lecturer stated that if the castings were not too large each of them might be subjected to routine testing by the rays, and irregularities corrected. Rough analysis of different steel was also feasible. Thus, if a number of carbon steel and tungsten steel bars had been accidentally mixed up together they might be quickly sorted out by means of X rays. "The radiographs obtained with the former are blacker than with the latter because the rays penetrate the tungsten steel less freely than the carbon steel owing to the higher atomic weight of the constituent tungsten." The method, however, has its limitations, because at present the rays can be made to penetrate only a few inches, about four at the most, of ordinary steel and a still smaller thickness of special steel alloys. Nevertheless, in view of the improvements which are being made in the process by the aid of the Coolidge X Ray tube and of existing currents at very high electric pressures, the future holds great possibilities. Even as the process stands to-day it is an enormous advance on any thing that existed at quite a recent period. For the manipulation of metal parts designed to carry a great strain and the failure of which would produce disastrous consequences, it must be of inestimable value.

THE PLANT DOCTOR.

Tropical agriculture plays so important a part in the life of the British Empire that more than common interest attaches to a suggestive description of "the Plant Doctor," as he has been evolved, or at all events, developed, by the war. The plant doctor belongs to the Imperial College of Science at Kensington. He is the product of a department, of which Professor Farmer is the head, for training men in the knowledge of the maladies incidental to particular plants and in the general physiology of those plants. "As a general practitioner has to know a great deal more than anatomy, so these students are encouraged to learn the whole constitution of a plant, both in its strength and weakness. Many have been sent out to the Eastern and Western tropics to deal scientifically with various aspects of agriculture; and while they have been grappling with this or that disease, new diseases have showed themselves, which in their turn have to be investigated and, as far as possible, conquered. The economic botanist has justified his existence; he has also demonstrated that without his aid agriculture is sadly handicapped in the strife with pests and disease; and the sphere of his conquests ranges from rubber to gooseberries." Altogether a very valuable acquisition to our list of public scientists is this plant doctor. His speciality is that the whole world is his parish. He is at home as well in the East as in the West. Indeed, it is probable that in the tropics he will find, if he has not already found, his most congenial sphere of work. I can imagine no finer career for an aspiring, intellectual young Indian than that opened up by this department of the Imperial College of Science. The time will probably come when every plantation will have a plant doctor on its staff or visiting it regularly in the same way as it employs a medical officer.

MINERAL WEALTH OF INDIA.

A great many years ago, nearly forty, I am afraid, when occupied in an editorial capacity

in Bombay, I one day received a visit from a gentleman anxious to interest me, and through me the journal with which I was connected, in the great mineral wealth of Central India. He brought many specimens of ore which he had picked up and amongst them some particularly rich examples of lead ore. I was only able to give him cold comfort as to the support which could be extended to his venture, as those were days when no one was greatly concerned in industrial development and the public looked askance at anything in the nature of mines; it had burnt its fingers over some swindles and dreaded the fire. The prospector passed on his way to obscurity, but his enthusiasm in speaking of the mineral wealth of particular districts in Central India has lived in my memory and I always recall it when the mineral productiveness of India is under discussion. The episode of which I speak recurred to me the other day when I read in the *Times Trade Supplement* a rather interesting article surveying the Empire's resources in lead ore. The writer states that the world's production of lead averages about 1,130,000 tons a year of which the United States supplies about 35 per cent, Spain 18 per cent, Germany 15 per cent, and Australia a little over 10 per cent. The other producing countries are Mexico, Belgium and the United Kingdom, Austria-Hungary and Italy. India does not figure in the list at all as a producer, she is merely shown to be a consumer in 1915 of 8,087 tons of lead. I wonder whether the story told of rich lead deposits in Central India by my visitor of forty years ago was a fairy tale or whether this natural wealth really exists. I wonder!

ARNOLD WRIGHT.

NOTES.

During the war Germany was in great need of rubber, which was unobtainable owing to the blockade. Her chemical engineering industry has, therefore, been very busy in endeavouring to produce substitutes; and a partial success was, apparently, achieved in the production of one or two synthetic substances which in some way are said to have answered the purpose; whilst of others, although substantial similarity to the genuine rubber was evident, the production could not be extended beyond the experimental stage, owing to the want of the necessary material or compounds. In the latter category was included a rubbery substance which could be obtained from a common plant which grows in abundance in North Africa, as well as in the Near East. It is of the species *Euphorbia*, consisting of shrubs or large trees (*tithymalus peplus* and *cyparissias*), commonly called in Greek *flomos*, and in Arabic *forbion*. In either form this plant contains a milky, acrid juice, which is sometimes poisonous, but is known to abound in caoutchouc (india rubber). The juice of these species of *euphorbia*, either exuding naturally or from incisions made in the bark, hardens in the air, like ordinary gum, and takes a light yellow colour. But to return to the German experiments; these have shown that the sap of the *euphorbia* contains one to three per cent of rubber, and if plants of the species *cyparissias* and *tithymalus peplus* are dried and reduced to a coarse powder, from which, by treating it with benzine, ether and carbon tetrachloride, an extract of the dark green colour is obtained which consists of two-thirds to one-half of fat. By dissolving this extract in ether and adding alcohol, a rubbery substance is derived, corresponding to 20 per cent of the extract. Assuming that one square mile of pasture land would produce an average of 1.2 kg. of fresh *tithymalus peplus*,

this represents 4.3 g. of rubber and 12 g. of fat, or 43 kg. rubber and 120 kg. fat per hect. Thus, with an increasing cultivation of *euphorbia*, considerable quantities of rubber and fat could be extracted by the installation of suitable plant for the purpose. And the undesirable and repulsive *tithymalus*, or *famos*, in the Near East, would thus become the base of a great industry and a source of wealth.

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Of the total area of the United States approximately 24 per cent is forested. Statistics secured during the past three years (1915-1917 inclusive) indicate that the average annual damage caused by forest fires amounts to approximately ten million dollars, and that there are upward of 28,000 forest fires annually in the United States. The chief object of forest patrol work is protection against fire. For this purpose the present method of detecting fires is by means of a system of well-selected look-out peaks. Mr. Henry S. Graves, Chief of the U. S. A. Forest Service, is of opinion—although no experiments have as yet actually been carried out—that the method of detection of fires could be greatly improved by the use of aeroplanes. Several disadvantages of aircraft for the purpose are brought forward. As a means of prompt detection of fires in rolling or flat country it is doubtful if aircraft patrol could be excelled, and it is probable that by adopting aircraft patrol the numbers of men required could be reduced. Besides their use for fire detection, according to *Aviation*, aircraft would be very useful for scouting on large fires. It is the duty of a fire scout to determine each day how the fire is progressing in order that it may be fought to the best advantage, and in country where getting about from one place to another is difficult the use of aircraft would be especially advantageous. It is suggested that aeroplanes might be employed for the speedy transportation of fire fighters

from point to point, and, further, that aeroplanes of the bombing type might even be of use in fighting fires by the dropping of fire-extinguishing bombs.

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The Government of India have had for some time past under their consideration the question of the continuance of the Cambridge Local Examinations as recognized examinations for European schools in India. After a comprehensive examination of the system and its actual working, they have now come to the conclusion that in respect of European schools the Cambridge examinations have, in the absence of a well established system of departmental tests, a claim to be utilized in India and they have agreed to the retention of the examinations subject to the following conditions which will be applicable in the case both of Indian and European students, *viz.*—(a) that the Local Secretary to be appointed by the Cambridge authorities for the purposes of these examinations in each province should be an officer nominated and approved by the Local Government; (b) that no pupils should ordinarily be admitted either for the Senior or for the Higher school certificate who have not been working at approved schools for a period of years to be fixed by the Local Governments concerned; and (c) that without absolutely excluding the entry of students other than those admitted under (b) the admission of such students should be subject to such provisions as may be laid down by the Local Governments. The Government of India would expect the provisions so laid down to admit of the entry of such students in very special circumstances only and on conditions such as the receipt of a certificate from an educational Inspector that the student has pursued a regular course of study under proper discipline and has, after personal examination, satisfied the Inspector that he is fit to enter for the examination and has special reasons for requesting to appear at it.

The *Madras Mail* writes :—Now that Sir Frederick Nicholson has reduced his activities in connection with fisheries he is devoting his time to examining certain minor industries and industrial problems. He is opening at Coonoor an industrial laboratory on a small scale to investigate the possibilities of some minor industries which will include the manufacture of vinegar, inks, adhesives and certain toilet soaps, and the mode of putting them up, and the extraction of certain volatile oils and essences from various odoriferous plants which will grow in and near Coonoor. For these and other such desirable products the whole presidency has to depend now on outside supplies. There is not a single ink factory in the presidency and all these foreign products are sold at high prices in the local markets. Sir Frederick Nicholson feels that an attempt can with advantage be made to produce these articles in the country. Colonel Cornwall, I. M. S., Director of Pasteur Institute, has agreed to place at Sir Frederick Nicholson's disposal a vacant laboratory at the Institute and Government have sanctioned Rs. 6,000 for initial expenditure in the purchase of raw materials and plant. Government are also providing a chemical assistant and the subordinate staff.

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In the course of a lengthy note submitted by the Bengal Chamber of Commerce to the Indian Currency and Exchange Committee, the Chamber, after an elaborate examination of the effect of the war on the Indian exchange and currency system, say that they do not consider that by debasement, inconvertibility or any other expedient alone, it will be possible to satisfy the requirements of trade. The requirements of trade demand stability at as low an exchange rate as is in the present circumstances, possible, and the Chamber believe that this can only be brought about by the combination of (1) readiness

and power of Government to sell councils or reverse councils to the extent of trade requirements within certain maximum and minimum rates, (2) recognition of the right of India to the free importation of both gold and silver, (3) provision of ample gold standard reserve of which a large proportion must be held in gold, (4) provision of a large metallic backing in the currency note reserve, (5) power to Government to refuse the encashment of notes temporarily, as a last resort, in the event of the price of silver rising above the exchange value of a rupee. Without further knowledge of silver markets and production, the Chamber are not prepared to name the rate of exchange at which the securing of stability is possible, but they hope that it will not be found necessary to fix the rate higher than that ruling to-day. Finally, before all other considerations, the Chamber place stability.

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It will be remembered that one of the Resolutions passed at the last meeting of the Board of Agriculture was that "in view of the great distance over which concentrated manures must be carried in India from the centres of supply to the fields of cultivators, the Board is of opinion that the question of reducing internal railway rates charged on such manures should be considered by the Railway Board". The Government of India have considered the recommendation and have now issued a circular letter on the subject to all Local Governments and Administrations. At present manures of all kinds, including chemical manures, are booked at rates between the specially low fixed maximum and minimum of one-third and one-tenth of a pie per maund per mile respectively, these rates being at railway risk, and the Government of India were in some doubt whether any further concession was necessary. The Conference of Agricultural Chemists held at Pusa in February last considered the matter and held that an all-round reduction of freight would lead to a greater

utilization of manures and that this, in turn, would result in increased transport of produce over the railways. They accordingly passed the following unanimous resolution:—"That in view of the importance of increasing the use of concentrated manures as a part of the general agricultural development of the country, the Railway Board be approached to arrange that the present minimum rate of one-tenth of a pie per maund per mile should be charged for complete wagon loads of concentrated manures." The Government of India do not consider it practicable to ask the various Railway Companies, irrespective of local circumstances, to adopt an absolutely uniform rate for the carriage of manures. At the same time they have impressed on the Companies the vital importance to Indian Agriculture of keeping the price of manures as low as possible and have requested them to give special consideration to all applications for reduced rates which may be made to them. It is left to local Governments and Administrations, in specific cases where this is considered necessary, to address the local railway authorities with a view to a reduction in the rates at present charged on concentrated manures.

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The Bureau of Electrical Exploitation, Department of Communications, Tokyo, has issued a pamphlet dealing with the Water Power Survey of the Japanese Government, an English translation of which has been received from the Commercial Secretary, British Consulate General, Yokohama. The object of the Survey is to investigate all possibilities for hydro-electric power sites for industrial purposes and to collect necessary and reliable data for future hydro-electric undertakings in Japan. The work includes the reconnaissance and investigation of power sites, their available heads and the discharge of rivers throughout the country. The power sites to be surveyed are those where more than 1,000 H. P. at draft can be acquired by economical exploitation. Much importance is

attached to the establishment of extra gauging and rainfall stations and the pamphlet contains an elaborate programme of the work to be done. The survey work was initiated last year with an appropriation of 195,544 *yen* and is expected to be completed in 1922 at a total cost of 830,657 *yen*. In Mysore, a similar survey would be a great help to industrialists.

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Mr. H. A. Carter writes to us, under date London, 17th May:—It is reported in London that inventors in the United States of America have lately perfected an easy method of spinning a good ramie yarn over ordinary cotton spinning machinery, a thing so far impossible. I have also seen samples of another fibre much longer in the staple than cotton spun into a good yarn over cotton machinery. I think the above report respecting ramie, which is also as you will know much longer in the staple than cotton, is true, and if so, they say in London it will lead to a great increase in Europe and America in Ramie spinning. The United States Government Bureau of Domestic and Foreign Trade, Washington, U. S. A., will be able to inform those interested if the report is true, and if so, which seems likely, to tell them the address of the inventors who will probably be willing to supply cotton spinners with full mechanical details of how to accomplish the spinning. All who grow plant Ramie in India should plant *close* because this method of planting produces tall *straight* stems, and the more straight the ramie stems are grown the easier they are to decorticate in machines for decorticating this fibre such as I, and a friend of mine, have invented. This is most important for the success of the ramie and China Grass Industry, and every planter in India and our colonies should know it. What Mons Faure Limoges, France, says, *viz.*, that he gets a yield of two tons of useful saleable fibre per acre, per annum, in ramie culture, at Limoges, in the South of France, seems further confirmed by a book which has

been published here, the author of which is a Mr. Oakenfull, J. C., called *Brazil in 1913* which says, "One Hectare ($2\frac{1}{2}$ acres) of land in Brazil should yield 4 crops of Ramie yearly of 40 tons each, 160 tons in all at 16 sh. to 20sh. per ton." This obviously refers to green ramie stems denuded of their leaves, which at 5 per cent yield of clean fibre would give about 2 tons of clean fibre, that is, China Grass, per acre per annum.

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"We think the machine will also do good for jute. Jute is the weakest of all the textile fibres in strength. Many English and German experts think that this lack of strength in jute does not arise so much from faulty cultivation as the Government of India seems to believe as it does from the system now pursued of separating the jute fibre by water retting process and they think if this separation was accomplished instead by a really perfect machine decorticator, the jute fibre would be very much stronger, and so would command higher prices in commerce, and be available for superior manufactures to those for which it is now used. It is confidently believed the machine will decorticate or separate the jute fibre quite as successfully as it will decorticate ramie and produce a much stronger jute fibre than the present and one which by special provisions which we have made in it will be quite as soft in quality and of as good colour as water retted Jute. Dealers set great value on the latter and so far have thought machine decorticated jute was not as soft as water retted Jute but we hope to prove to them that they are mistaken. The German experts gave this as their opinion before the war; of course, while the war has been on we have had no communication with them.

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At the seventh meeting of the Industries Section of the Board of Industries held at Naini Tal on the 14th June, 1919, the follow-

ing among other matters were dealt with:— It was decided to recommend to Government that State Technical Scholarships in the following subjects be awarded during the year 1920:—(1) Glass-making, (2) The Dyeing of Textile Fabrics, and (3) Electrical Engineering. On a previous occasion, a scholarship in glass-making had been suggested by this Board, but as it was subsequently explained that facilities did not exist in England for giving a really first class training, the matter was not proceeded with. The Board expressed the opinion that it was possible for conditions in this industry in England to have altered considerably since then. But if such should not be the case, arrangements might be made for the students to be trained in America or Japan, preferably the former place. A note regarding the preliminary training of Mr. Mahesh Prasad Bhargava, a nominated State Technical Scholar, who is to proceed to England in August next to pursue a course of training in Grass Pulp working, was approved by the Board. For the purpose of carrying out experiments in the manufacture of glass, using the sodium carbonate which is manufactured locally from Reh deposits, the Board recommended that a grant of Rs. 5,000 for this purpose be set aside.

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We publish in this issue an article on Industrial Research in the United States of America written by Dr. Fields, Ph.D., F.R.S., to the *University of Toronto Monthly*. The article deserves to be read and pondered in this country, for what Dr. Fields describes makes not only interesting reading but also points to the need for development work of a similar kind out here.

GLEANINGS.

At the meeting on May 22nd of the Royal Commission on Income-tax, under the Chairmanship of Lord Colwyn, at the Surveyors' Institution, evidence was given by Sir Charles Campbell McLeod (Chairman of the Imperial Commercial Association and of the East India Section of the London Chamber of Commerce) on the subject of the imposition of double income-tax as it especially affects India. He stated that such double taxation reacted adversely upon the Indian Exchequer, and retarded the development of India's natural wealth and staple industries, because her trade and commerce were largely financed by capital belonging to British subjects, who are called upon to pay double income-tax in respect of their Indian interests. Income arising in India should be regarded, he said, as a preserve sacred to the Indian Exchequer. Where the income was that of a man who had worked in India, made his money there, and left it there for the purpose of his business, although he himself now resided in the United Kingdom, he suggested that in any case British income-tax should only be levied on such Indian income as was remitted to this country. He suggested further that there should be no British taxation levied on the profits of companies operating solely in India or the Dominions. The main object to be achieved, he submitted, was to avoid the tax-payer having to pay two income-taxes within the Empire, and that the distribution of any tax raised should be a question of negotiations between the Mother Country and the Dominions.

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An electric melting furnace that may revolutionise the making of brass has, according to the *Board of Trade Journal*, been perfected by the Bureau of Mines but it has not been put on the market for profit. It is

known as the Electric Rocking Furnace, and patents have been taken out by the Bureau. The new furnace is the result of five years' experiments by the chemist of the Bureau, in co-operation with the Cornell University, the American Institute of Metals, and a number of manufacturers of Brass. Up to the present most Brass has been made in the United States in costly crucibles of imported clay and graphite. Since the war it has not been possible to obtain the imported materials for crucibles and manufacturers, it is stated, have had to put up with a very inferior brand at a cost many times over that of pre-war times. It is estimated that unnecessary losses in Brass-making are more than 3,000,000 dollars a year in normal times, and perhaps 10,000,000 dollars in war times. The Bureau of Mines states that it is inevitable that the next few years will see electrical furnaces, and there will be a development comparable to that seen in the steel industry in the last few years.

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It is reported that the Japanese have been suffering for the past few years from an abnormal rise in the price of rice caused by a shortage in Japan, and that, with a view to relieving the situation, attempts have been made to import large quantities of foreign rice with the result that there has been a decline in local prices. The Government of Japan have recently introduced a bill providing for the encouragement of Agriculture, supplementary to a scheme which the Government have in contemplation for the organization of a large Agricultural Company with a capital of 30 million yen, supported by influential business men throughout the country. The Department of Agriculture and Commerce, Tokyo, has further obtained a credit of 140,000 yen for the present fiscal year for the encouragement of afforestation by the distribution of young plants among farmers, particular attention being paid to the planting of bamboos. [One yen = 2s. 0½d.]

From a report on the International Fair, held recently at Lyons, we note that the Austin Motor Company were exhibiting a Tractor for farm purposes capable of ploughing three furroughs ten inches wide and six deep in practically any land. It requires petrol for starting, but kerosine is the normal fuel, the consumption being about two gallons an hour. When not in use as a Tractor for ploughing, harrowing, reaping, etc., or for driving standing machinery, the motor is made suitable for road haulage purpose by removing the steel studs from the driving wheels, and substituting India rubber pads; with these attached it will haul four tons on a gradient of 1 in 12 at five miles an hour.

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Plans for the erection of a plant in Trinidad for the manufacture of Bamboo Paper pulp have been completed. The machinery has been ordered from the United States of America. The shortage of paper has caused a Scottish publishing house, in order to make sure of its future supplies, to turn its attention to Trinidad. This firm has planted 1,000 acres of land with bamboos, in addition to securing a concession to cut bamboos on crown lands in the Island. In due course paper pulp will be manufactured from the Bamboo. There are still people in India who doubt of the possibilities of the bamboo in the paper line.

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Mr. Pilgrim, tanning expert to the Government of India, in his report to the local Government, considers the samples collected in his mangrove forests and elsewhere likely to yield as in Borneo a saleable red tan extract, but has a much greater belief in a species of carapa, if this could be obtained by cultivation in sufficient quantities. As it is a timber tree, its use for tanning purposes may only be possible in districts where nothing is done with the timber. He recommends tests of the tree by the periodical stripping of the bark.

Additional evidence of the hold which Japan has secured on the Indian market is furnished by the annual report on the maritime trade of Bengal for 1918-19. The average value of the imports from Japan into Calcutta for the five years ending with 1915-16, was Rs. 148 lakhs. In 1917-18, it amounted to Rs. 603 lakhs, and in the year under review it rose to nearly Rs. 1,139 lakhs, representing a little less than 18 per cent of the total foreign import trade of the port. The number of Japanese vessels entered and cleared at Calcutta during the year was 131, as compared with 94 in the previous twelve months.

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From the *Travancore Government Gazette* it is seen that Messrs. George Brunton and Sons, Engineers, Cochin, and Chekoo George Papuli of Ernakulam have patented one invention for "improvements on and cheapening of the manufacture of match boxes and matches." The original inventor is Papuli and the firms claim a new process of manufacturing match boxes from the leaves of the Cocconut and Palmyra palms and match splints from the ribs of Palm leaves.

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The average daily circulation of the *Advertiser of Adelaide* is 66,218 copies. The population of this town is 200,000 and that of South Australia 450,000. In proportion to population no newspaper in the Commonwealth has a circulation as large as that of the *Advertiser*, which is more than three times than that of any daily paper published in South Australia. When will our people know that advertisement is the road to commercial success?

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The new paper mill to be erected by Messrs. A. E. Reid & Co., Ltd., will stand in the Parish of the New Hythe. It is said that this mill will be the largest in England and will contain a dozen modern paper making machines. This mill will give employment to several hundred paper workers. When is the first Mill in Mysore to come into being? We are still in the discussion stage.

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A preliminary forecast of the jute crop of 1919 has been issued. A consolidated statement for Bengal, Behar and Orissa and Assam states that the estimated area under jute m

the three Provinces is 2,749,120 acres, an increase of 248,738 acres, or about 9.9 per cent on last year's final figures. The increases of the preliminary forecast this year on the final forecast last year were:—Bengal, 182,037 acres; Behar and Orissa, 53,501 acres; Assam, 13,200.

Two hundred thousand acres of forest land in Great Britain are to be replanted, at a cost for planting and maintenance for the first ten years of £17,000,000, according to an announcement by the Government. The trees will replace some of the heavy timber cut down during the war, and provide additional forests so that the country may be independent of other timber sources in case of emergency.

With a view to encouraging the cultivation of 'dry' food-grains to meet the present scarcity of food the Government are pleased to declare that any person raising 'dry' food-crops on unoccupied assessed Government land that has not been cultivated in faslis 1327 or 1328 anywhere in the Madras Presidency will be exempted from assessment during fasli 1329. Collectors are requested to give wide publicity to this order.

The *Board of Trade Journal* for May 8 contains an illustrated supplement dealing with the arrangements made by the Board of Trade for the British Industries Fairs of next year. The scope of the fairs will be largely extended, and they will be held simultaneously in London (Crystal Palace), Birmingham, and Glasgow. The three fairs are distinct from one another in regard to exhibits and trades.

A report of the seaborne trade of Bengal for 1918-19 shows that the aggregate value of the whole import and export trade was over Rs. 206 crores, which is a little short of the highest pre-war figure. This represents an increase of Rs. 35 crores over the figures of 1917-18. The increase is shared by both imports and exports, working out in the former case at 16 per cent, and in the latter at 21 per cent.

The Madras Government have given up the idea of establishing a Mechanical Engineering School at Cocanada. They have

directed the Director of Industries, Madras, to report whether schools on the model of the Madras Trades school cannot be usefully opened at one or more places in the Northern Circars at which there are public works, workshops, railway works or rice, jute or other factories.

Referring to the discussion of the Sugar question in this *Journal*, Mr. Hamel Smith of *Tropical Life* says:—"The *Agricultural News* and the supporters of the Cane Sugar may be glad to know that in all probability the matter will again be discussed not only in America but in a London Trade Journal, and also in a Southern Indian Monthly which has already published several articles on Pan-British Sugar Productions."

As has been frequently pointed out in this *Journal*, India, if properly equipped, could be made to produce on its present acreage a surplus of sugar; more than enough to satisfy its deficit of 800,000 tons, and sufficient even to satisfy Great Britain's needs were the brains and ability present in India did all that has been done so much of late for sugar production in Cuba and Java.

The latest imposed in Corea is a Sugar consumption tax, which took effect on 1st April last. It is levied on sugar, molasses and syrup on a graduate scale. The tax is to be paid at the time of taking over sugar, molasses or syrup from a factory or bonded zone by the person taking it over. The tax may be remitted by Government on sugar, etc., exported to foreign countries or Japan.

Attention is drawn in an American consular report to the developing of a market in Colombo for earthenware and porcelain lined sanitary bathroom installations.

Imports into British India in March increased by £2,897,000, whilst exports decreased by £2,366,000, as compared with last year.

The Turkish fig crop in 1916 is reported to have been about 19,000 tons, 16,500 tons in 1917, and 18,000 tons in 1918.

TOPICS FROM ECONOMIC PERIODICALS.

ENGINEERING TRADE IN INDIA.

The *Near East* of May 19, says:—

The Indian machinery market needs special attention on the part of British engineer manufacturers in view of the increasing industrial activity in Japan, especially in the production of modern types of agricultural and industrial machinery, and of the systematic efforts of the Japanese manufacturers to introduce their products into that market. Of course, the Japanese are not the only competitors there, for there are the American and Continental manufacturers, who are also endeavouring to secure a firm footing in the Indian market, and who, by studying local requirements and assisting prospective native purchasers with much-needed and appreciated advice, gradually gain the latter's confidence and their own purpose. Their energies are not confined to the principal centres; they also extend to remote districts, which, apparently, are somewhat neglected by British manufacturers. The latter should bear in mind the important fact that while the Indian purchaser in and around the large centres has every facility for obtaining the articles he requires for any industrial purpose there is a strong and persistent tendency towards the creation of new industrial enterprises under modern methods in the more remote districts. Purchasers in such localities, while anxious to develop the resources of their country, and knowing perfectly well what they want to do, are in many cases without knowledge of where the plant required can be procured. The Government of India and some of the Provincial Governments have appointed officers to assist prospective purchasers with advice; but, valuable as this official assistance is, it is not sufficient; and British manufacturers must take an interest in this question themselves. For instance, when an inquiry from such sources comes through for a plant of machinery it is useless for a manufacturer to quote for a portion only. He should estimate for the whole thing, whether he makes all the appliances himself or not, as the purchaser is quite unable to piece together a number of estimates from a variety of sources into a practical whole. If, while in such perplexity he applies to, or is approached by a non-British manufacturer, the result is obvious. Such opportunities aid the efforts of the latter.

BRICK AND TILE INDUSTRY.

There is a good opening for modern machinery for the manufacture of bricks, tiles, slabs, water-pipes, etc., in India, and manufacturers of this

machinery would be well advised to investigate the prospects there. The tile industry was first introduced into the southern districts of India in 1865 by the Basel Mission, the factories of which gradually developed, and run now on up-to-date lines, in which every modern invention finds a place, the whole machinery being driven by steam. There are now over twenty-eight tile-factories in Mangalore, the first home of the industry, among which the works owned by the mission and two or three other firms are reputed for the quality and quantity of their output, which includes side products of a variety of descriptions, but especially for their ornamental cement flooring tiles, which are very popular with the house builders. The annual joint output of three factories in roofing tiles is estimated at over Rs. 100 lakhs, under normal conditions. The Indian-owned factories employ the bulk of the 2,000 or more operatives, who are seen every morning wending their way to one or the other of the many factories which occupy the two sides of the town, bounded by the river. About six of the Indian-owned factories are driven by steam, and produce tiles which are a decided improvement upon the article made by the old methods and packed in the old pattern firewood kiln. The annual output of roofing tiles ranges from thirty to forty millions, and depends upon the foreign market, the local sale being insignificant. This industry seems to be the only one which has not been affected by the war. Probably this fact is an encouragement to further enterprises, for it is announced that the establishment of modern brick and tile factories is contemplated in other parts of India.

IMPLEMENTS AND TOOLS.

According to recent reports, it is evident that with regard to the trade in implements and tools generally in India the British position has not been seriously assailed. It is, therefore, recommended that British manufacturers should continue to supply their well known lines, keeping the price as low as possible, in view of the competition of Japanese and locally-made substitutes and of the well-finished American specialities. In cutlery it may be said that the Indian market is waiting for the full resumption of British supplies. Here Japan and, to a smaller extent, America are the only countries which have made any progress towards occupying the place formerly filled by Germany in this trade.

PRODUCTION OF PLANT ESSENCES.

The *Bulletin of the International Institute of Agriculture* says:—

The resumption on a large scale, after the war, of the manufacture of scented soap and perfumes, will make the production of plant essences very important. The plants that produce these essential oils in the Dutch East Indies are wild or cultivated.

Among the wild species may be mentioned the "cajuput" from which is obtained cajuput oil by distilling the leaves. Adulteration with paraffin, benzine, etc., is all the more common as it is not easily detected; adulteration may, however, be detected by violently shaking a bottle half filled with the oil; the air bubbles produced vanish at once in the pure liquid, remaining, however, for some time in the adulterated product. The green colour of the oil is due to the presence of copper and chlorophyll compounds; this is why a small piece of copper is often added to the product. Cajuput oil is much used in therapeutics. It is mostly exported to Singapore, the chief market of the product for British India. It is also sent to the United States where it is used in making a number of proprietary pharmaceutical products. Good quantities are also bought by Siam, Hongkong and Timor Island: in Europe, the chief buyers are Great Britain, Holland and Germany. In 1913, 1914 and 1915 the total exports were 124,228, 65,469 and 79,863 kg. At present there is a tendency for eucalyptus oil to replace this product.

The species cultivated occupy an area of about 3,000 hectares, 2,700 of which are in Java alone. They are often found with other crops on large estates. The chief essential oils furnished by these species are given below:

Citronella oil is obtained by distilling "serchwangigrass" a grass mostly cultivated by the natives; 1,000 kg. of the grass yield about 7 kg. of the oil, which is mostly used in soap and perfume making (synthetic essence of roses). The chief producing countries are Ceylon and Java; Java produces by far the smaller quantity, but the product is of better quality and fetches twice the price of the other. The exportation of Japanese citronella oil to all countries was:—1913, 75,330 kg.; 1914, 136,654 kg.; 1915, 234,326 kg.; 1916, 428,743 kg.; 1917, 515,763 kg.. The largest importers are the United Kingdom, the United States and Japan.

Lemon-grass Oil.—Produced from the grass of the same name, the yield being 0.2 per cent. Importers prefer the oil from Cochin China and Reunion.

Cananga Oil.—Obtained by distilling the fresh flowers of the cananga, a tree that usually flowers twice a year, giving 60 kg. of flowers; to obtain 1 kg. of oil requires at least 350 kg. of flowers. This product is exported in small quantities; not mentioned in official statistics; it has to compete with ylang-ylang oil from the Philippines, which costs 10 times as much.

Champaca Oil.—Obtained from the roots of the vetiver or cuscus grass; the roots contain from 0.4 to 0.9 per cent of essential oil; no official statistics as to its exportation are available.

Patchouly Oil.—Is obtained by distilling the stems and leaves of *Pogostemon Patchouly* Pell. The leaves can be gathered repeatedly, at intervals of six months. The east coast of Sumatra furnishes most of the supply.

Geranium Oil.—Is obtained by distilling the leaves of *Pelargonium* spp., the essential oil of which much resembles that of the rose. It is widely cultivated, especially in rubber plantations. During some researches it was found that seventy-one plants gave 76.5 kg. of leaves, which produces 53 cc. of essential oil containing as much as 58.8 per cent of geraniol.

THE COMPOSITION OF THE SOIL.

Simple fact Regarding its Chemistry.

The *South African Sugar Journal* in an interesting article on the composition of the soil says:—

Considering what an important part the soil plays in the life of the farm, it is surprising how few know much about its structure. There is no reason why this should be neglected, for the soil presents a most interesting study, and one which should be at all times profitable. It may be advanced that few have the opportunities owing to the pressing nature of their work to undertake studies of this kind, which is true enough as far as it goes, but if it results in an improved knowledge and better yields, and, consequently more money, it will be admitted that nobody can afford to neglect such investigations.

If any soil be examined that has not been disturbed by tillage operations, it will be seen to be composed of layers which are always in the same order, no matter what soil it is or where it may be. The best place in which to make an examination of a soil, is in a railway cutting, or a donga, or in any place where there is a deep opening between two portions. An examination of such a section will reveal a grass

or vegetable layer about three inches deep at the top, which is generally called turf. Below this is a layer of the soil proper ranging from a few inches to a few feet or more in depth.

Below this again, in some cases, is what is called the subsoil. There are cases in which there is no subsoil at all, but on the other hand the subsoil may extend downwards to a great depth. The subsoil can be distinguished from the soil and turf by the fact of its being lighter in colour. Sometimes, in the lower portions of the subsoil, or where the subsoil is absent, immediately below the soil proper, we find rubble or broken rock mixed up with the earth. Underlying the whole is the solid rock from which the overlying soil has been formed.

There are the structural divisions of a soil. They do not all exist in every soil, but when they do occur they are always in the same order. Sometimes while the different divisions can be seen, it is impossible to find any actual line of separation between them.

Next we come to the composition of a soil, or the ingredients of which it is composed. There are five of these: *viz.*, stones, sand, clay, lime and humus. It is on the preparation of these constituent parts that the farmer bases his opinion of the value of a soil, so far as its mechanical condition is concerned, for agricultural purposes. It forms, in fact, the basis of classification of soils for the purposes of classification and description.

VARIETIES OF SOILS.

There are endless varieties of soils, but every soil can be included in one or other of the following seven classes: (1) Sandy, (2) Loamy, (3) Clayey, (4) Marly, (5) Calcareous (*i.e.* chalky), (6) Gravelly, (7) Humus.

The description of a soil depends upon the relative proportions of its five proximate constituents. For instance, if humus predominates, we call it a humus or peaty soil; if sand is a large constituent we term it a sandy soil. It is scarcely necessary to point out that it is impossible to give hard-and-fast percentages of constituents for each class of soil, but we can decide upon approximate proportions which will assist us in classifying soils that come under our observation.

If the planter in the course of his wanderings will test his knowledge by estimating the character of the soil, he will find the information gained valuable, and the practice in differentiating between them very helpful.

The following percentages will be useful as representing the limits of each class: Sandy soil should contain over 90 per cent of sand. Sandy loam

should contain from 80 to 90 per cent of sand. Loamy soil contains from 70 to 80 per cent of sand. Clayey loam contains from 20 to 50 per cent of clay. Clayey soil contains over 50 per cent of clay. Marly soil contains from 5 to 20 per cent of lime. Humus soil contains over 5 per cent of organic matter. These facts are worth storing up, so that when a certain treatment is recommended for a certain soil, a farmer may see at once what it is composed of.

CLAYS.

Clay comprises the sticky, plastic part of the soil. When there is too much of it, the soil is heavy. Every fertile soil must contain lime, even if only in a small proportion. Limes make stiff soils, such as clayey ones, more crumbly and friable, and is therefore added to improve the soil.

HUMUS.

Humus is the animal and vegetable matter, which decaying, have accumulated in the soil and mixed with the mineral constituents. All fertile soils contain some humus. The terms organic and inorganic are often used in relation to the soils, and there must be many times when they puzzle the farmer striving to understand what he is reading about. The meaning of such terms can be impressed upon the mind by a very simple experiment:—

Suppose one were to take a quantity of dry soil on a shovel and heat it over a fire to a red heat, part of the soil would burn away, while a portion would remain in the shovel unaffected by the heat. The part which burns away would be the organic part, and the portion remaining, the inorganic.

The proportion burnt away in any soil would depend upon the amount of humus, or decayed organic matter present in the soil. In a peaty soil there is sometimes as much as 90 per cent of humus, so that if a sample of such soil were burned by far the greater part of it would disappear into the air, leaving a relatively small amount of inorganic or mineral matter.

The part that disappears in the burning consists of carbon, hydrogen, oxygen, and nitrogen.

These facts are but the A B C of soil chemistry, but the knowledge of them may prevent many mistakes being made, and induce better farming practice.

BAMBOO AREAS IN BURMA SUITABLE FOR PAPER PULP MANUFACTURE.

The *Indian Trade Journal* for June 27, publishes (1) extracts from a Note, dated 2nd February, 1919, by Mr. W. Raitt, F.C.S., Consulting Cellulose Expert to the Government of India, on certain bamboo areas in Burma recently examined with a view to utilization for the manufacture of paper pulp, and (2) a similar Note, dated 30th April, 1919, on an area in the Thayetmyo District by Mr. J. D. Hamilton, Extra Assistant Conservator of Forests. The Government of Burma (Forest Department), to whom it is indebted for the two Notes, accepts no responsibility for the opinions expressed by Messrs. Raitt and Hamilton but thinks that the information contained in the Notes may be of interest to firms which are considering the possibilities of the paper pulp industry:—

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Note on certain Bamboo Areas in Burma recently examined with a view to their Utilization for the Manufacture of Paper-pulp, by Mr. W. Raitt, F. C. S.

THE KABAUNG AREA NEAR TOUNGOO.

There is plenty of bamboo but the Kabaung is a bad rafting river and it connects with the Sittang which is equally unreliable as a means of transport for pulp in boats to a port. A factory site at Sinseik on the Kabaung would be satisfactory as regards water-supply and a somewhat expensive siding could connect it with the main line of railway which would have to be depended on for transport of product to Rangoon but the business will not stand the cost of rail transport. Lime also is a difficulty—there is some in the hills to the east but the samples of it I have seen are poor in quality and difficult to burn and it would have to be transported in carts some fifteen miles. The alternative is Zibingyi lime from the Maymyo extension line and this also involves a long railway carriage. I do not think this area is of much account at present or until all the more suitable locations have been taken up.

MOULMEIN.

The areas on the Ataran river promise well. The river is tidal to well into the forests and the short tributary streams above tidal influences can be used

for small rafts during the wet season, these being collected at the junctions with main river and sent down it in large rafts at any time throughout the year to a factory site which could be placed well down the river for it contains fresh water at high tide for a considerable distance down. From such site the product can easily be barged to steamers at Moulmein. The transport facilities are therefore good. There is, however, some doubt about the sufficiency of bamboo. In considering this I am providing for a probable expansion of factory output from 10,000 tons per annum now to 40,000 tons in the future. The forests are not typical bamboo country. There are no large solid blocks of bamboo; it occurs in patches but these patches are frequent and I think will be found sufficient considering the large total area (178 square miles including Dali) of the reserves. Limestone exists in large amount in the rock outcrops bordering the Ataran which in several places are on the river banks. It is not, I think, of first class quality but probably good enough. Better stone can be brought if necessary from Pa-an on the Salween forty miles up by boat at a sufficiently low cost. Fuel will be somewhat expensive about Rs. 6 per dry ton delivered at factory. It would be advisable to allot a fuel reserve to any factory operating here when the cost would probably be somewhat reduced. It is possible to import Bengal coal at a cost which may not exceed Rs. 15 at factory which is equal to about Rs. 5 per ton for wood and this makes a reserve to fall back on should wood fuel prove a difficulty in the future. Export facilities from Moulmein are good as the port is open all the year round. Local labour is available in the forests from January to April.

SALWEEN.

I went up as far as Shwelon but no small launch could be got to go higher. Visited the Pa-an limestone quarries. From what I could learn of the bamboo on the Yunzalin tributary I do not think there is enough of it for a factory supply and there appears to be no other within reach. Considering that there is a certain amount of doubt about the Ataran supply, I think it would be wise to reserve the Yunzalin as an auxiliary area to the Ataran. The Gyaing river bamboo areas are no use. I did not think the Sittang was worth visiting. Above the Pegu canal, which provides communication with the Irrawaddy and Rangoon, it may be useful, but the Sittang mouth is bad at all times of the year for navigation and impossible during the monsoon.

AKYAB AND KALADAN RIVER.

Good prospects here. The river is as good if no better than the Ataran and a factory site can be got

some twenty miles above Akyab where the water is fresh. Akyab is an open port all the year round. Bamboo exists in very large quantities close to tidal water on the main river and its tributaries. Its cost *per dry ton* is however more than on the Atarain. The species existing (*Melocanna*) is very light and since costs depend mainly on the number cut and not on their dry weight the dry ton cost works out higher than elsewhere. Still it is not too high. The short flowering cycle of this species—about fourteen years I understand—introduces an element of uncertainty but against this the period of recovery is only four years and flowering is not simultaneous or general all over the division; it proceeds slowly over a period of about seven years; consequently the areas which have first flowered have reached the full crop stage before later areas commence. I think this characteristic makes it safe but it does of course increase the total area required by a factory. *Limestone* of good quality can be brought by boat from Ramree island some sixty miles down the coast from Akyab. *Firewood* exists in large quantities close to the proposed factory sites. Forest labour supply is good.

II.

Note on Bamboo area suitable for paper pulp manufacture in the Thayetmyo District by Mr. J. D. Hamilton.

Locality.—The area lies roughly between the following boundries.

- N. Southern watershed of the Mindon River.
- S. Thayetmyo District boundary.
- E. Irrawaddy River.
- W. Foot of Arakan Yoma Range.

The total area may be taken to be at least 400 sq. miles. The bamboos are largely concentrated in the drainage of the Made Chaung and in many places come right down to the banks of the Irrawaddy River. The Made Chaung comes out at Kama a small town on the Irrawaddy River about twenty miles above Prome. The I.F. Company steamers call at Kama. A Pulp Factory would be best put up somewhere in this vicinity. But even Prome is not too far away and being at a railhead may offer some special attractions.

Species.—The bamboo referred to in this note is *Dendocalamus strictus*, Bur. Hmyinwa—sometimes called the male bamboo owing to its generally yielding more or less solid stems. But all hmyinwa stems are by no means solid and when the bamboo is hollow the walls are usually very thin. But as the area in question is taken to contain sufficient solid culms to meet factory requirements it is as well to say so with an expressed knowledge of the above peculiarity.

Supply available.—About nine million bamboos are cut annually from this area for trade purposes, *i.e.*, the forest department collects royalty on this number. It can be safely said that there would be no difficulty in procuring a further twelve million especially as the pulp trade would not trouble about the straightness of culms. As the solid stems are usually not so straight as the hollow the area really has a large and easier supply of the former. This means of course great economy. The weight of 18 ft. long dry bamboos of average thickness I find to be 8 lbs. 280 bamboos would thus go to a ton and 12,000,000 bamboos would give 40,000 tons. Mr. Raitt expresses a doubt as to the possibility of procuring this amount in Moulmein. The Thayetmyo area is free from this doubt.

The cost of extraction of the bamboos to the factory would be about Rs. 8 per ton reckoning dry weight. In the green or semi-green state it would be much less.

Flowering.—So far as I know the Hmyinwa bamboo does not flower in the same universal manner as other species. The flowering is sporadic, and the bamboo always seems to be in flower in patches—more so perhaps in some years than in others. Seed is thus nearly always available. So that if the intensive cutting of culm showed signs of any area being in danger of depletion it would always be resown by simply scattering seed collected from some other locality. As a safeguard it would be a much less irksome method than requiring firms to cut only a certain number of culm from each clump. A method so full of difficulties as to be hardly practicable.

Fuel.—Firewood is plentiful and would cost about Rs. 5 per dry ton delivered at the factory, *i.e.* assuming the factory would be somewhere near Kama.

In the Made valley there is also coal of much the same quality as that recently tried on the Burma Railways. This coal could to some extent be brought down on bamboo rafts. I have not examined the extent of the coal bearing area and merely mention a possibility which may prove valuable.

Lime—Great quantities of lime are available from Tondaung and Peilthalin villages a few miles below Thayetmo. It is at present manufactured at both these villages. It is derived from a Nummulitic limestone of excellent quality.

Fresh water-supply.—The Irrawaddy River.

Sulphuric acid.—There are large deposits of iron pyrites not far from Kama. That at the surface is not rich in sulphur. But being on the spot it would be worth examining.

Facilities of exports—The pulp could be taken in cargo boats to Rangoon or Bassein for shipment either by the I. F. Co. or private arrangement,

THE MANUFACTURE OF CALCIUM CARBIDE, CALCIUM CYANAMIDE AND CYANIDES IN INDIA.

The Indian Munitions Board *Industrial Hand-book*, 1919, (revised edition), just published, contains an interesting note on the manufacture of Calcium Carbide, Calcium Cyanamide and Cyanides in India by Dr. L. L. Fermor, Geological Survey of India. The Note concludes with the following summary:—

The foregoing note is the result of a preliminary investigation into the possibilities of manufacture in India of calcium carbide, calcium cyanamide, and sodium cyanide. Lack of detailed information prevents the setting forth of a definite scheme showing costs and possible profits, except in the very approximate manner attempted at the end of this summary. But such figures as are available suggest that there would be a considerable margin of profit on the manufacture of calcium carbide in India, in consequence of which it would probably pay to manufacture not only all the carbide required in India, but also other products manufactured from carbide, namely, the impure calcium cyanamide known commercially as nitrolim, and sodium cyanide. It is thought, however, that the Indian consumption of these materials may not be sufficient to justify the installation of an economic unit of plant. Consequently, the proposal is made that the plant should be designed to produce 6,000 tons of carbide annually, which would be disposed of as follows* :—

6,000 tons calcium carbide—

- 1,000 tons for sale in India.
- 1,000 tons for sale in Eastern Markets.
- 4,000 tons for transference to the cyanamide factory yielding 5,000 tons nitrolim to be utilized as follows :—

5,000 tons nitrolim—

- 4,600 tons for sale as manure in India, Ceylon, Java, Sumatra, etc.

400 tons for conversion to sodium cyanide.

Four possible sites for such an industry are mentioned, two using electric power generated from

*Judging from information received since this note was written, the scale of operations suggested is too small and should be at least twice as extensive. This would mean a greater reliance on export to commence with.

Mond gas, and two using hydro-electric power. The site selected for investigation is Burhar in Rewa State. The production here of 6,000 tons of carbide annually by the use of electric power generated from Mond gas with recovery of ammonia as sulphate, would require :—

	£
<i>Electric energy—</i>	
4,000 k. w. yrs. at £4·75 per k. w. yr. (from 24,000 tons low-grade coal) ...	19,000
<i>For production of carbide—</i>	
5,800 tons of first class coal at Rs. 6-8-0.	2,513
4,711 tons of lime at Rs. 13-0-0 ...	4,083
180 tons of electrode carbons at £15 ...	2,700
<i>For production of cyanamide—</i>	
1,750 tons of liquid nitrogen—cost of production not known—original value Nil ...	
<i>For production of cyanide—</i>	
431 tons of salt (duty free) at £1·5 approxi- mately ...	647
Total ...	28,943

The quantity and approximate value of the products, annually, would be—

	£
2,000 tons of calcium carbide (80 per cent CaC ²) at £13·5 ...	27,000
4,600 nitrolim (20·22 per cent N) at £12·2. ...	56,120
825 tons sodium cyanide mixture = 250 tons NaCN at £70 ...	70,500
Total value of products ...	100,620

Above it was estimated very roughly that the power and carbide sections of the scheme would cost £134,000. It is very difficult to obtain reliable information on such matters, but from a careful analysis of the very imperfect data available, it seems likely that the capital outlay on the cyanamide and cyanide plants would be about £50,000 and £5,000, respectively. The total capital outlay required for the whole scheme would then be—

	£
Power plant ...	101,000
Carbide plant ...	30,000
Cyanamide plant ...	50,000
Cyanide plant ...	5,000
Total ...	189,000

*The estimates of capital costs are presumed to be on a pre-war basis.

On this basis the annual outlay would be roughly—

	£
Cost of energy ...	19,000
Cost of materials ...	9,943
Labour and administration ...	12,000
Depreciation at 10 per cent on £85,000.	8,500
Repairs and renewals at 3 per cent on £85,000 ...	2,550
Packing in drums 2,000 tons of carbide and 825 tons of cyanide mixture at £1·5 per ton ...	4,238
Packing in bags 4,600 tons of nitrolim £0·5 per ton ...	2,300
Loss in dust (carbide, ...)	1,050

Total expenditure ... 59,581

	£
Value of products ...	100,620
Therefore, profits ...	41,039

To this must be added 5 per cent interest on capital cost of power plant (£104,000) included in cost of power 5,200

Total profit ... 46,239

The above figures show a profit of 48 per cent on the capital cost of the chemical plant alone, or of 24 per cent on the total cost of chemical and power plant. The data on which this estimate is based are admittedly inadequate, but the figures are probably approximately of the right order, and the amount of profit shown leaves an ample margin for such charges as interest on cost of acquisition of land, for increased cost should this enterprise be undertaken under abnormal conditions, or for decrease in the value of the products after the war should there be cutting of prices due to over production in Europe. The figures, however, are sufficiently encouraging to show that the scheme outlined in this note is worthy of serious investigation by duly qualified people.

In this note no consideration has been given to the further industries depend upon nitrolim or calcium cyanamide as raw material, *viz.*, the manufacture of ammonia from cyanamide, with conversion into ammonium sulphate, nitrate or phosphate for use as fertilizers, and the further oxidation of ammonia to nitric acid by one of the Ostwald group of processes for the provision of the nitric acid required in such large quantities in the manufacture of explosives, amongst which ammonium nitrate may be mentioned.

Before any such scheme as that outlined in this note can be carried out, very careful consideration will have to be given the competitive effects of

ammonium sulphate obtained as by-product from coke ovens, and *via* the Haber process.

It is only necessary to make a passing reference to the industries dependent upon cheap supplies of acetylene derivable from calcium carbide, such as the manufacture of acetic acid and acetone, and the use of the oxy-acetylene flame for welding, liquid oxygen suitable for this purpose being obtained as a by-product in the manufacture of calcium cyanamide.

Should the scheme here outlined be subsequently supplemented by the plant necessary for the production of ammonia and nitric acid, we should be providing India with a very desirable Janus-like or double-faced scheme capable of providing fertilizers in times of peace and explosives in times of war.

The extent of the Indian consumption of the several materials may be judged from the following tables embodied in the note:—

Table 1.—Imports of calcium carbide from 1912 to 1918.

Year	Quantity	Value	Value per ton
	Tons.	£	£
1912-13 ...	685	10,131	14·79
1913-14 ...	1,000	15,474	14·47
1914-15 ...	874	12,749	14·59
1915-16 ...	1,118	18,117	16·20
1916-17 ...	888	23,716	26·70
1917-18 ...	642	24,682	38·44

Table 2.—Imports of potassium cyanide from 1912 to 1918.

Year	Quantity	Value	Value per ton
	Tons	£	£
1912-13 ...	283	24,917	88·04
1913-14 ...	264	22,730	86·10
1914-15 ...	207	18,151	87·68
1915-16 ...	50	5,021	100·42
1916-17 ...	54	5,938	109·96
1917-18 ...	2	593	296·36

Table 3.—Imports of sodium cyanide into India (excluding Calcutta) from 1913 to 1917.

Year	Quantity	Value	Value per ton
	tons	£	£
1913-14	21	1,821	86'74
1914-15	55	5,141	93'47
1915-16	385	36,939	95'90
1916-17	401	41,478	103'43

Table 4.—Imports of calcium cyanamide of India since 1912.

Year	Quantity	Remarks
	Tons	
1912	135	The average sale price before or in the beginning of the war f. o. r. Calcutta was £13'33.
1913	170	
1914	275	
1915	1,400	
1916	200	
1917	...	

*Figures kindly supplied by Shaw, Wallace and Company Calcutta.

INDIAN TEA SEEDS AS A SOURCE OF OIL.

The following article appears in the current number of the *Bulletin of the Imperial Institute*, London :—

A sample of Indian tea seed (*Camellia Thea*) was forwarded by the Chief Scientific Officer of the Indian Tea Association in September, 1917, at the suggestion of the Imperial Institute, in order that the yield and character of the oil it contains might be ascertained in comparison with that obtained from *Camellia Sasanqua* seed, the usual source of commercial tea-seed oil from China.

The sample was described as Assam Kharikatia tea seed from the Jorehaut Tea Company. It consisted of dark greyish-brown seeds, which were

mostly spherical and measured from $\frac{1}{8}$ to $\frac{3}{8}$ in. in diameter. The shell was rather less than $\frac{1}{2}$ in. in thickness.

The kernels, which were wholly or partly covered with a thin, wrinkled, brown skin, were spherical in shape, hard and yellow, and could be easily split into halves.

The seed consisted of kernel 58 per cent and shell 42 per cent.

The air-dry kernels contained 10'4 per cent of moisture and yielded 17'3 per cent of clear golden-yellow liquid oil, with a slight, not unpleasant taste and smell. This yield is equivalent to 19'2 per cent of oil from the dry kernels.

The oil extracted from the kernels with slight petroleum was submitted to chemical examination with the following results, compared with those recorded for the oil from *C. Sasanqua* seed from China examined at the Imperial Institute.

	Present sample of <i>C. Thea</i> oil	<i>C. Sasanqua</i> oil
Specific gravity at $\frac{15^{\circ}\text{C.}}{15^{\circ}\text{C.}}$	0'921	0'918
Solidifying point of fatty acids	32'8° C.	...
Acid value ¹	3'6	9'4
Saponification value ¹	194'2	193'4
Iodine value per cent	93'2	87'5
Hehner value	95'2	...
Insoluble fatty acids per cent	93'7	...
Unsaponifiable matter do	1'5	...
Volatile acids, soluble	0'14	...
" " insoluble	0'16	...

¹ Milligrams of potash for 1 gram of oil.

The oil furnished by this Indian seed is of the "non-drying" class and resembles the tea-seed oil of commerce derived from *C. Sasanqua*. There is no doubt that the Indian oil would be readily saleable if it could be produced in commercial quantities.

The amount of oil contained in the kernels is low, viz., 17'3 per cent as compared with 58 to 59 per cent in *Sasanqua* kernels. Seeds of kernels containing such a low percentage of oil as the Indian tea-seed kernels are usually not of commercial

importance as sources of oil unless the residual cake has a high value as a feeding-stuff or for some other purpose. Tea-seed cake contains saponin, and is therefore not suitable for uses as a cattle food. The Chinese tea-seed cake has been principally employed for the manufacture of worm-killing preparations for use in horticulture, and for this purpose was offered at about £8'10s. per ton *c.i. f.* London before the war. The cake from the Indian tea-seed could be utilised for the same purpose.

The small yield of oil from the Indian tea-seed and the comparatively low value of the residual cake render it unlikely that the seed could be remuneratively employed as a source of oil. Only in the event of large supplies of the seed being available at a low price does it seem probable that the extraction of the oil on a commercial scale could be recommended. It would not be remunerative to export the seed or kernels and the oil would therefore have to be extracted in India.

INDIAN TRADE IN RUSSIAN CENTRAL ASIA.

It is reported that there are bright prospects for the development of British trade in Russian Central Asia, Trans-Caspia and the countries contiguous to the Black Sea, not to mention territories east of the Caspian and the Syr Daria.

Trade in Russia has long been at a standstill, but with a return to normal conditions there is sure to be a trade boom. The disturbed condition of the country precludes any precise estimate being made of the future value of the Russian market for Indian produce, but its potentialities should certainly be considered by Indian merchants. Pre-war statistics show a decided partiality for Indian goods and this tendency will be revived with the establishment of a stable Government in Russia. The war has produced acute economic conditions in that country, and with them has arisen the need for development of Russian industries, ways and communications, for which such products as jute, rubber, oilseeds, tanning materials, etc., will be required, in addition to foodstuffs such as tea, coffee, rice, spices and other articles. There

is now a shortage in Russia of all commodities usually imported, and an abnormal accumulation of savings which mean potential purchasing power in the hands of a class where spare funds are usually low. Seeing that the products are of daily use to large classes the demand for such articles must increase when order is restored.

In view of competition it should be to India's advantage to take possession of what promises to be a large and lucrative market in Russia and Russian Central Asia.

Russian merchants who appropriate the possibilities of Indian trade advise organization and co-operative effort and deprecate merely individual attempts.

As far as routes are concerned for this trade those *via* the Black Sea, Vladivostock and the Siberian Railway, and to a limited extent the Ladakh-Yarl and road, would appear to be the best.

AGRICULTURAL EDUCATION IN THE CENTRAL PROVINCES.

Mr. D. Clouston, M.A., B.Sc., Director of Agriculture, Central Provinces, Nagpur, writes in the *Agriculture and Co-operative Gazette* :—

The two Agricultural Middle Schools to be opened this month at Chandkhuri and Powarkhera mark the beginning of what promises to be a new era of agriculture in the Central Provinces. By working through the more enterprising adult farmers the Agricultural Department has made rapid progress within recent years in stimulating their practical interest in its teaching. Millions of pounds of improved seed are now being supplied annually from seed and demonstration farms managed by Tabsil Agricultural Associations and Co-operative Unions, the members of which have been induced to co-operative for the common weal. A keen demand for new manures and improved implements has arisen; and the silent, plodding tiller of the soil is now beginning to realize, as he never did before, the enormous possibilities there are of increasing his farming profits by adopting the improved methods of cultivation recommended by the Department.

The success achieved in these Provinces in helping the ryot to help himself has been largely due to what I may call the object-lesson system employed of demonstrating improved methods of husbandry. These

methods have been demonstrated to him in his own village and on his own land. Hundreds of seed and demonstration farms scattered throughout the Provinces have served their purpose as object lessons of the best kind, run as they are by the cultivators themselves working under the advice and guidance of the Department. The ryots of Chattisgarh, though the most backward in the Provinces, are now raising profitable crops of cane, cotton and groundnut on poor lateritic soils, locally known as *bhata*, because the Department has shown them how to. These waste *bhata* lands, which have for ages produced only a very inferior crop of speargrass, are now being regarded as the most valuable in the Division, and their value within the last three years has increased tenfold in consequence. The enterprising ryots of the cotton tract are now growing nearly a million acres of that very prolific and profitable variety of cotton known as *Roseum*, because the Department has convinced them that it is the best they have ever tried. In the wheat tract of the north of the Provinces many thousands of acres are now cropped with improved strains of wheat and *til*. We may fairly claim, therefore, that the interest of the cultivators of the Provinces in improved agriculture has been stimulated, and that the way for further progress has been prepared.

As a result of the teaching of the Department the more intelligent landholders are now beginning to demand for their sons an education that will give them power to understand and to apply effectively the results of the experimental and research work carried out for them by the Agricultural experts of the Department. They are beginning to realize, too, that the literary system of education given in their rural schools at present does not fit their boys for their life's work as farmers. Influenced by these considerations the Chief Commissioner, Sir Benjamin Robertson, attaches the very greatest importance to the opening of these Agricultural Middle Schools on Government Farms.

These schools are primarily intended for the sons of the landed aristocracy of the Provinces; they will be the training centres for the farmers of the future. Their aim will be to give a good liberal education combined with a training in the principles and practice of improved agriculture. The sons of *bona fide* landowners, between the ages of 14 and 18, who have passed the Upper Primary School, are to be admitted. On the staff there will be two teachers, both of whom have been trained at the Agricultural College, Nagpur, and one of whom has also been trained in pedagogy. For each school a well furnished hostel, a reading room, library, museum, and a play-ground where the boys will play

hockey, football and other games in their spare time, have been provided.

To give the teaching a practical bent each school will have an area of 30 acres, which the boys themselves will cultivate on improved lines. This training in actual farm-work will, it is hoped, make them good, practical, self-reliant farmers, and give them at the same time a true sense of the dignity of labour.

One of the great difficulties which the Department has to face in opening schools of this kind is the want of agricultural literature suitable for boys; but steps have already been taken to supply this want. An Agricultural Reader and a Book "Lessons on Indian Agriculture" have already been written and are now in the Press; the latter book contains lessons on the history of agriculture, on soils, tillage, manures, plant-life, farm-stock, dairying, insect pests and agricultural co-operation. The lessons are beautifully illustrated and have been written in simple language and with a definite object in view, namely, to interest the reader in different phases of rural economy. The aim of both books is to idealize rural life, for, if we give the sons of the soil a vision of something better than they have known in the past, their occupation becomes attractive and more worthy of their attention.

It is hoped that these Agricultural Middle Schools will in course of time develop into Agricultural High Schools which will send students to the Agricultural College, Nagpur, for a still more advanced course in the science of agriculture. Such schools should go far to make our future farmers take a more intelligent interest in their life's work to attract to this noble profession the best brains of rural areas, and to raise the standard of life and comfort in our villages.

SPEECHES AND PRONOUNCEMENTS.

INDIAN INDUSTRIES IN PARLIAMENT.

In the course of the Indian Budget Debate, in the House of Commons on the 22nd May last Dr. E. Hopkinson said :—

I hope the House will extend to me the indulgence it usually extends to a Member addressing it for the first time. Perhaps I have some excuse for taking part in the Debate, seeing that I am the only Member of the House who is also a member of the Indian Industrial Commission. There was one statement made by the Secretary of State this afternoon which will give the utmost satisfaction not only in this House but also in India. It was that the labours of that Commission are not to be set aside or lost sight of, but that the recommendations and the Report of the Commission will be fully considered now that the chairman, Sir Thomas Holland, is in this country. If there was one thing more than another which became abundantly clear during the investigations of that Commission it was the deep interest taken by the Indians themselves in the improvement of the industrial position of India. The Commission had unusually good opportunities of ascertaining not only the physical possibility of increasing the industrial wealth and improving position of the country, but also the attitude of the Indians themselves towards those ends. We had as our President Sir Thomas Holland, a man of great ability, who knew India, perhaps, better from the point of view of the natural resources of the country than anyone else. He had himself served in the Government of India, and had brought the Geological Department of the Government of India to a degree of efficiency second to none in the world. We had also on the Commission four Indian members, three of them great leaders of industry in India, and the fourth a politician pure and simple—I will not say with no interest, but with comparatively little intelligent or instructive interest in the industries of India. We had also on the Commission two or three members of the Civil Service of India, and myself, of whom it cannot, at any rate, be said that I was tinged with any preconceived notions from the Indian point of view.

I do not desire to weary the House by referring in detail to the findings of the Commission and the recommendations contained in their report, but I would like to refer to some of the most vivid and vital impressions which resulted from our investigations. No more striking impression was made upon

the minds of all of us, even those who knew India well, than the enormous potential wealth of the country. Though the wealth is there, buried in the soil or ready to be extracted from the soil by the natural processes of agriculture, it is scarcely developed compared with what it might be. The reason is not far to seek. Let me cite agriculture, first of all, as an example, because it perhaps more clearly than any other branch of industry shows what might be done compared with what has been done. The wealth of India is primarily due to its agriculture. The Government of India has a scientific agricultural staff in quality second to none in the world, but in quantity ludicrously insufficient compared with the problem which it has to tackle. It is the third country in the world in the extent of its production of wheat and barley, but where the production of wheat and barley is represented by twenty per acre in England, in India it is only represented by eight. It does not seem to me a very great thing to suppose that by the application of scientific methods and research that figure of eight might be changed into ten, and that would mean millions sterling to India. Take another illustration. India produces more sugar than any other country in the world, but the consumption is so great and the methods so wasteful that it actually spends ten million sterling annually on importing the sugar that other countries produce. Let me take one other instance in connection with agriculture. I think it is the most striking of all. Before the invention of synthetic indigo by the Germans, the cultivation of indigo was one of the most flourishing industries in India. We are aware how by patient and scientific research, and the expenditure of money yearly upon research, the Germans displaced the natural indigo of India by the synthetic product. The trade was absolutely killed. During the War there was a revival of the industry, and that revival was brought about by a series of investigations in regard to the preparation of the natural product. It was given in evidence before the Commission by one of the most experienced planters in Behar that he would undertake to grow indigo now on his plantation, taking advantage of all improvements, and to sell it at pre-war prices at a profit. That means, and I wish the House to take cognisance of the fact, that the pre-war German trade in indigo could be killed outright on its merits. Is not that a striking fact? Does it not make it worth while that the recommendations of the Committee should receive serious consideration at the hands of the Government of India and of the right hon. Gentleman the Secretary of State? Before I pass from agricultural questions, I want to emphasise the need that the scientific department of the Agricultural Department in India should have more money spent

upon it, and that it should be enlarged. What is required is that brains should go out from this country to help in the scientific work. Reference has been made by one of my hon. Friends to the supply of tungsten. That is a trade which before the War had passed entirely into German hands. Under the pressure of war it has come back into British hands. India could produce all the tungsten the world requires, and all that is needed is practical development of the trade. There is another metal, thorium a most important metal, one essential for the production of gasses. The trade in that, too, was allowed to pass into German hands. This country, by availing itself of its opportunities in India, could now become self-supporting in that regard. India possesses copper. The mines in Burma produce lead and zinc, and if there were only a concentration camp it would be possible to obtain sulphuric acid, which is a basis of many very important industries.

Even that feature of the situation has a brighter side. Thanks to the assistance and sympathy of a Liberal Government on the scientific side, and not much of that, although the intention was really good, a great Tartar firm were induced to set up iron and steel works which have become one of the most flourishing and most important works in the world. India now can supply all the rails she wants, and before long she will be able to supply our own needs. That has been done entirely by native effort and with native capital, but it was done with the sympathy and help and the scientific advice of the Government of India. That is one of the fundamental things which the Commission desire to see extended and developed throughout India. The Government should provide scientific help for research work, which is necessary for the development of the country industrially, and should also by sympathy expressed in various ways—it may be in improved transit or by help in the acquisition of land—I could suggest a dozen different ways—aid the development of industrial India. Let me relate one instance to the House to show the attitude of India itself towards this aspect of the question. An Indian witness before the Commission made what appeared to me to be a curious statement. He said the Government of India should pass a law providing that half the directorate of every company should be Indian. It appeared to me that that might be due to jealousy of British industrial methods in India, but on examination I found that it was not so. The real idea was that Indians should be taught how to work and manage the various undertakings. It was desired to convert every board of directors into a school. The idea, of course, is ludicrous, but the statement was

significant as showing the trend of the Indian mind towards industrial measures.

The manufacturing industries of India are obviously divisible into two classes—those already developed, such as the great jute industry of Bengal, the cotton industry of Bombay and to some extent the woollen industry of Cawnpore. There are a number of other industries, such as the manufacture of glass, cement and matches. There are also the chemical trade and the manufacture of paper, both of which are still undeveloped for want of technical knowledge and expert advice. What the industries of India require is not British capital, but British brains. They need expert advice, and scientific knowledge applied to the latent resources of India will bring forth a harvest of a hundredfold. But that is not the whole story. Other factors must also be taken into account. Indian labour must be considered. In the course of our inquiry we made careful investigations, not only into the remuneration of Indian labour, but into housing and sanitary conditions. If the problem of labour is acute in this country, it is ten times more acute in India. I say that advisedly. The rate of wages in India is far too low for tolerable subsistence. Industrial conditions in India in many cases, and have particularly in mind the cotton mills of Bombay, are so monstrously bad that I could hardly relate to any decent assembly of people what I myself saw in the course of my investigations. Although a Lancashire man, I greatly admire the action which the predecessor of my right hon. Friend the present Secretary of State took with regard to the cotton industry, but I do wish he had taken that opportunity of throwing upon the Bombay mill-owners the onus of improving the housing conditions of their work people. I believe, and I say it advisedly after conversing with a great number of the mill-owners that the best are perfectly ready to shoulder the burden if they are assured it would be distributed over the whole. And there again, is a brighter side to the picture. The new steel works of the Tartar firm to which I have already referred are in all matters of housing up-to-date in every possible respect. Each cottage has its garden, each coolie line has ample space around it, and the water supply is perfect, and yet that firm in spite of all its expenditure in that direction, is able to pay a dividend of 200 per cent.

That sort of thing cannot be done in India without cost, but the cost amply justifies itself. You may go to other places and find conditions equally good. I myself investigated the conditions in one of the largest mills in Bengal. That mill was able to make a selection of labour by drawing it from a very much larger area, simply because that firm had the reputation of supplying pure water, indeed it was

nicknamed "Mill Pure Water." Not only was the water good, but the housing conditions, the coolie lines, and the sanitary arrangements were all in first-rate condition and up to date. So much impressed was I by what I saw at the mill, that that evening, when I met the then Governor of Bengal, Lord Carmichael, who retired a year ago, I suggested to him that it would be an encouragement to mill owners if he at once made an inspection himself of that particular mill. I made the further suggestion, which he at once adopted, that he should take with him the leader of the Home Rule movement in India. Next day the Governor and the Pundit motored up to this mill to inspect the sanitary arrangements. That is an example of how the Government of India can show sympathy with, and give effective assistance, without any cost to itself, towards putting the industrial conditions on a higher level. My friend the Pundit was not at all pleased with the result of the expedition. It always troubled him to find that the British, of their own accord and with nothing to reap from it, were usually ready to put all questions relating of the health and welfare of their people in the first place.

Another no less important matter is the question of education. The educational system in India is a most extraordinary structure. It is fitted with a magnificent coping and balustrade, but it is built on sand. India is an absolutely illiterate country. Over 90 per cent, of the people can neither read nor write. India possesses magnificent universities, which turn out graduates by the thousands yearly. Take the University of Calcutta, where abuses became so great that it was made the subject of a special inquiry. What does that University do for India? It does nothing but turn out by the thousands annually persons who have been drawn off from the real interests of India and turned adrift to find a living in other directions. I asked in Indian who was giving evidence in Calcutta what became of the graduates of that University. His answer was a striking answer coming from such a source. He said, "A very few of them become pleaders; the great majority of them become clerks; and those who have not the ability or opportunity to become clerks become sedition mongers." That was the considered opinion of a practical industrial Indian of one of the universities of his own country. That problem is not insoluble. I can give an instance of another side of the picture, which I should like to put before the President of the Board of Education in this country. If you go to certain mills in Madras, there you will see elaborate comfortable, delightful, buildings, put up for school purposes. Residing in these buildings are two English ladies. The buildings are used for housing classes formed of the children of the people who

work in the mills. There is no compulsion. The schools are always full. The children are absolutely free to attend or not to attend. Around the schools are gardens. Every child—the scholars are numbered by hundreds—has his plot of land which he cultivates as he desires, and he takes the product of his cultivation home to his own people. For brightness, alertness, respectableness and cleanliness, these Indian children would compare with the children of similar age in any school you like to name in this country. Yet these very mills were chosen by the political dissentients to foment strife and trouble. That was not because there was any real grievance. The reason for it was that they could not stand such an object lesson of what British people have done for Indians to be always before the eyes of their people.

I am well aware that after the announcement of 20th August 1917, there can be no question of turning back from the policy which was then declared. It must go forward on lines which the Government, after the fullest consideration, determined to be the best. But I beg the Government of India and the Secretary of State to take into consideration that it is more important to feed the hungry than to give them political rights, that it is more important to clothe the naked than to invest them with political doctrines and dogmas, and that it is more important to educate the people to be able to vote than it is to give them the vote. What will be the effect of the franchise? It is estimated that the number enfranchised will be anything from 1 or 2 up to 5 per cent. The greater part of that number will be illiterate people. I presume the voters will be taken blindfold to the ballot boxes, or that, as an alternative, the ballot boxes must be embellished in some way to show what they contain or are intended to contain. I presume that one box will be embellished with the Union Jack, another with the Crescent, and another with the emblems which are familiar at every roadside shrine in India. I rejoice in what the right hon. Gentleman says of the recommendations of this Commission, which have solely for their object the improvement of the industrial conditions of India, and to make India more profitable and more fit for the Indians themselves to enjoy living there, which I trust that no political considerations will be allowed to cloud.

FROM UNIVERSITY TO INDUSTRY.

A Clearing House Proposal.

Sir Richard Vassar-Smith presided on Tuesday, May 20, at a meeting of representatives of the universities and colleges and representatives of the Federation of British Industries called to consider the setting up of an organization which might act as a clearing house between universities and the industries of the country.

The meeting was attended by representatives of the Universities of Birmingham, Bristol, Cambridge, Durham, Glasgow, London, Manchester, Oxford, Sheffield, and Wales, the Imperial College of Technology, and the University College of Nottingham. Letters had been received from Queen's University, Ireland, and Liverpool University, expressing their sympathy with the scheme.

The Chairman said that it was desired to make some arrangements by which young men leaving the universities would have the opportunity of passing into productive work, which would give full scope to their abilities and education. Such an organization should enable the man of real merit to obtain a post which would allow him to use his abilities to the fullest extent. Personally he felt that such an organization was needed, as in the future it would be more imperative than ever that each man, in whatever grade, should be working efficiently. There was a need in industry for a supply (and the maintenance of that supply), of the best intelligences of the country. It was in order to discuss this question that the meeting had been called.

Mr. H. A. Roberts, of Cambridge University, said that the suggestion would meet with the approval of all interested in national well-being. There were difficulties in setting up such an organization, and it might be advisable in the first case to limit its activities until further experience had been gained; it was very undesirable to begin a scheme on too grand a scale until experience had been obtained.

TRAINED MEN GOING OVERSEA.

Professor Ferrier, of Bristol University, pointed out that there had been no difficulties in placing the really first-class men, but men of the second class certainly needed assistance. In many cases the second-class men had made good, when they had been able to obtain a position which offered scope; ability was not confined to academic distinction, and this was especially the case in regard to work in industry and commerce. As a rough estimate he

would say that 5 per cent of the first-class university men would be required for research purposes. The remaining 95 per cent would be employed as ordinary routine business men. They had been a marked tendency for the university trained men to proceed oversea, and even in the United States the English university man was generally sure of finding employment. It was to be hoped that this exodus of the finer grade of worker would be stopped by the offer of suitable employment in this country.

Professor Baker, of the Imperial College of Science and Art, stated that the real difficulty was in fixing the second-grade students, although there must really be a demand for them. In the chemical industry, for instance, there was routine work which would be more ably carried out by the trained man. In most cases, at present, this was carried out by the ordinary worker. The value of the well-trained man in routine work was not appreciated at present, and he hoped that the scheme which had been outlined would lead the employer eventually to come to the organization for such men besides the supermen of research.

Professor Lea, of Birmingham University, hoped that the scheme would include all grades of men. Industry needed all grades, and education could never hope to produce men of one grade only. He thought the Federation, being such a thoroughly representative body, could best tackle this scheme, which he felt would encourage closer co-operation between the university and industry.

The Master of Pembroke College, Cambridge, stated that there had been a great increase in the number of employees who were now sending their sons for university training. This was an excellent sign, and should help eventually in obtaining the co-operation for which Professor Lea hoped.

Professor Bulleid, of Nottingham University College, hoped that the institution of such an organization would not mean putting another barrier between the student and the possible employer; he had always found that the most satisfactory method for obtaining posts for the student to write to the employer direct.

Dr. R. A. Duff, of Glasgow University, suggested that it might be found that centralizing vacancies in the proposed clearing house would be the best way of tackling the problem. This was a question of administration, and would no doubt be considered before fully settling the scheme.

Miss M. H. Mead, of Manchester University, asked whether the organization would deal with women. In reply, it was stated that the term "students" had been expressly used in the memorandum to convey that both men and women were included in the scheme.

It was decided that a further meeting should be held shortly to settle practical points in the setting up of the scheme.

ECONOMIC NOTES.

AGRICULTURE.

Diarrhoea in Cattle.

The Bombay Department of Agriculture, has issued the following leaflet (No. 5 of 1919) on Diarrhoea in Cattle,—

It is frequently observed that, on the arrival of the monsoon, cattle are attacked with diarrhoea and that weak animals succumb to its effects in considerable numbers. This is due mainly to the sudden change of diet when animals partake largely of green food to which they are not accustomed. The ill effects may be accentuated by the sudden change of climate resulting in chill.

Symptoms.—The frequent passage of very fluid and bad smelling dung. The animal has a staring coat and is uneasy. There may be straining. If inflammation is present there will be loss of appetite, fever and moaning. The animal becomes exhausted. Mucus and blood may be passed. Death results from pain and collapse.

Treatment. (a) *Preventive.*—Any change of diet should be brought about gradually. Animals must not be allowed to gorge themselves on green food. A certain proportion of dry food of a digestible nature should be given and gradually decreased until animals are accustomed to a diet of purely green food. Animals should not be exposed to sudden cold or allowed to drink excessive quantities of water.

(b) *Curative.*—The patient must be kept warm and at the same time given plenty of fresh air. When the weather is cold it should be clothed therefore and kept out of draughts. Small quantities of easily digested food should be given at frequent intervals. Rice gruel should be given in quantities of one to two seers, three or four times a day. Water should be given sparingly. In the first stage it is advisable to give a mild purgative consisting of one seer of linseed or other vegetable oil with half a chattack of turpentine added. After that the following medicine should be given in gruel twice a day:—

Powdered chalk (karya mitti)	...	$\frac{1}{2}$ chattack.
or		
Charcoal (kolsa)	...	2 do.
Powdered catechu (katha)	...	$\frac{1}{4}$ do.
Powdered ginger (sonth)	...	$\frac{1}{4}$ do.
Powdered opium (aphem)		
or		
Indian hemp leaves (bhang)	...	1 tola.
Country liquor (sharab)	...	2 chattack.
For calves give a quarter of the above quantities.		

CO-OPERATION.

Long Term Loans in Malnad.

The following note on the organization of a financing agency for long term loans on the mortgage of immovable property in the Malnad has been issued by the Mysore Economic Conference for discussion:—

The proposal is to establish an institution with limited liability for the purpose of making long term loans on the mortgage of immovable property. The institution will be cast on co-operative rather than on joint-stock lines in order that the opposition of interests between the lender and the borrower which is always likely in an institution of the latter kind may not be possible in this case. The membership of the institution will be open to the whole State, but the loans will be confined to the agriculturists in the Kadur, Shimoga and Hassan Districts. The share capital is fixed at 5 lakhs made up of 10,000 shares of Rs. 50 each.

The management of the institution will be similar to that of ordinary credit society. Subject to the control of Government through the Registrar of Co-operative Societies, the general body will be the controlling authority in all matters relating to the Bank. For the daily working of the Bank, the general body will elect a small Board of Directors who will administer and conduct the affairs of the Association, prepare and issue agreements, declarations, etc., and generally represent the Bank. The Board will also be empowered to appoint, control, and dismiss paid officials like cashiers, agents, book-keepers, etc. The work of the Board of Directors will be controlled by a Board of supervision who will pass accounts, issue instructions to the Board of Directors from time to time with regard to the general working of the Bank, authorise the issue of mortgage bonds and decide appeals against the Board of Directors.

The object of the Bank is as already stated, to make loans to the malnad ryots for the purpose of redeeming them from their prior indebtedness on the mortgage of immovable property. An investigation was made some time ago into the indebtedness of the agriculturists of two hoblis in the Sagar Taluk. The number of families examined was 2,100, of whom 1,650 were found to be indebted to the extent of just over 5 lakhs. Nearly half the number of families above own no lands and do not therefore come under this scheme. Of the remainder, nearly

half, or about 400 to 450 families are fairly heavily indebted. But if they are relieved of their indebtedness and enabled to carry on their occupation, they can, it is believed, work themselves up into an independent position in the course of about 25 years. The loans of the proposed Bank are intended to be confined only to such cases; and in order that the Bank may benefit as large a number of agriculturists as possible, the loans are limited to a minimum of Rs. 1,000 and a maximum of Rs. 5,000, and in no case will a loan exceed 60 per cent of the value of the properties on which it is secured.

On the above basis, the capital required for the Bank has been calculated at about 30 to 50 lakhs. For the present, it is intended to limit it to 30 lakhs. Of this 5 lakhs will be raised from shares and the rest from advances from Government and the issue of debenture bonds. After the formation of the Bank it is intended to approach the Government for a substantial advance of about 5 to 10 lakhs. It is also intended to issue redeemable debenture bonds. These bonds will be issued on the security of the immovable property of the borrowing members. They will carry interest not exceeding 6 per cent and will be redeemable in 25 years. For this purpose, a sinking fund will be formed. The Bank will also have the power of recalling the bonds at any time if its funds permit of such recall. It is proposed that the interest should be guaranteed by the Government.

Some more details will be found in the draft bye-laws which will be circulated to the members. Reference may however be made to one or two points on which the bye-laws are silent. One of these points is the method of valuing the properties on which loans are to be granted and debentures to be issued. This valuation has to be very accurately made and the Bank will therefore have to have competent agents for the work. In the duties of these agents will be included not merely the valuation of properties but also the supervision of the use to which loans are put by members taking them and periodical inspection of the properties on which these loans are secured.

A second point is that it is proposed to give to this Bank the power of foreclosing a mortgage without recourse to a Civil Court. Such power is given elsewhere and it is believed that there are no serious objections to invest the Bank with this power.

A third point is that it is perhaps advisable to entrust this work to the Central or the Provincial Bank as both already possess an organization complete in most details. It is understood that both the institutions are prepared to take up the work.

APPENDIX.

THE MALNAD LAND MORTGAGE ASSOCIATION.

1. This Association shall be called the Malnad Land Mortgage Association.
2. The offices of the Association shall be situated at Bangalore.
3. The object of the Association is to grant loans to members provided that such members reside or own immovable property in the malnad portions of the districts of Kadur, Shimoga and Hassan.
4. The liability of the members of this Association shall be limited to the value of the shares held by them in the Association.
5. There shall be 10,000 shares in the Association of the value of Rs. 50 each.
6. Membership of the Association is open to every subject of His Highness the Maharaja of Mysore who is legally capable of entering into a contract.
7. Every member of the Association must take at least one share and no member can own more than 100 shares in the Association.
8. Shares are not withdrawable nor transferable except with the sanction of the Association.
9. The Association may raise funds by loans, by debentures and by grants by the Government of His Highness the Maharaja of Mysore, but at no time shall the liability of the Association exceed the sum of Rs. 30,000,000.
10. The Association shall not grant loans below Rs. 1,000 nor above Rs. 5,000 in any case, provided that where a loan is granted to a Co-operative Society for the use of its members, the amount of the loan shall not exceed Rs. 20,000.
11. Loans granted by the Association shall bear interest not exceeding 7 per cent per annum.
12. Loans granted by the Association shall be repayable in equal yearly instalments not exceeding 25. Nothing in this bye-law shall be considered to preclude the borrower from repaying his loan wholly or in part in cash or in mortgage.
13. The yearly instalment referred to in Section 12 shall be calculated as follows:—
The interest due on the loan for the period which it is granted shall be added to the principal and the total amount shall be repayable in equal annual instalments within the period of the loan.
14. The working expenses of the Association may be recovered by the levy of a charge not exceeding one per cent per annum on the loans granted by the Association.
15. Loans shall be granted by the Association only on the mortgage of immovable property.

16. Loans granted by the Association shall not exceed 60 per cent of the value of the property which is mortgaged to the Association on account of those loans.

17. The valuation of the properties offered as security for loans shall be made by the Association in accordance with subsidiary rules to be framed in that behalf.

18. Loans granted by the Association shall not be liable to be recalled so long as the annual instalments and other charges due thereon are duly paid, provided that if a loan is utilised for a purpose different from that for which it was granted and if the property on which it is secured is in the opinion of the Association allowed to diminish in value, the loan shall be recalled without reference to the terms on which it is granted.

19. The Association may issue mortgage bonds made out to the holder, bearing interest not exceeding 6 per cent per annum, and liable to be drawn for redemption within a period not exceeding 25 years.

20. Loans are also liable to be recalled—

- (1) If after the grant of a loan the information obtained regarding the property, the charges thereon and the rights of disposal thereof is found to be incorrect;
- (2) On the retirement of the borrower from the Association;
- (3) If the debtor remains more than 6 months in arrear with a payment due.

21. If, in any case, not expressly provided for above the Committee of Management consider that a debt is in danger, they shall recall the loan with the approval of the Registrar of Co-operative Societies.

22. When a loan recalled by the Committee of Management is not repaid within 3 months from the date of recall, the Directors shall in the exercise of the authority vested in them under———, order a foreclosure of the mortgage and this order shall have the same effect and shall be executed in the same manner as if passed by a competent Civil Court.

23. The amount of the bonds issued shall not exceed 75 per cent of the claims pertaining to the Association on mortgages.

24. The Association shall draw for redemption by lot as many mortgage bonds as its financial condition permits, or, if the Association deems it preferable, it may repurchase its bonds instead of drawing them by lot.

25. The whole of the assets of the Association, especially its claims on mortgages, are liable for the payment of interest and the repayment of bonds.

26. The interest payable on mortgage bonds and the dividends on shares are guaranteed by the Government of His Highness the Maharaja of Mysore.

27. The Association shall be at liberty to effect a reduction in the rate of interest payable on any series of mortgage bonds provided that option is given to the holders of such bonds to accept payment in cash at par value.

28. The Administration of the Association shall be vested in the following:—

- (1) Committee of Management.
- (2) Board of Supervision, and
- (3) The General Meeting of the members of the Association.

29. Members of the Committee of Management and of the Board of Supervision must be members of the Association, provided that the Government of His Highness the Maharaja of Mysore shall have the right to nominate a person, whether a member of the Association or not, to each body.

30. The Committee of Management shall consist of seven members, six of whom are elected by the members and one is nominated by the Government of Mysore. Where a member is not nominated by the Government, the seventh member shall be elected by the general meeting.

31. The Board of Supervision shall consist of seven members, six of whom are elected by the general meeting and one is nominated by the Government of Mysore. Where a member is not nominated by the Government, the seventh shall also be elected by the general meeting.

32. Confidential agents may be appointed so far as desirable and as far as practicable, who shall superintend the business assigned to them within fixed areas by the Committee of Management.

33. The Committee of Management may grant reasonable remuneration to the agents for their trouble.

34. The Committee of Management shall administer and conduct the affairs of the Association, prepare and issue agreements, declarations, etc., represent the Association by one of its members selected for that purpose at all legal proceedings. It shall also appoint, control and dismiss officials like book-keepers, cashiers, clerks, local agents, etc.

35. The Board of Supervision shall control and supervise the conduct of business by the Committee of Management. In particular it will—

- (1) cause the accounts of the Association to be audited at least once a year by two of its members, to receive and pass the accounts of the Committee of Management;
- (2) to present to the general meeting a statement of accounts;

- (3) to prepare all instructions necessary for the carrying out of these bye-laws ;
- (4) to settle the principles of land valuation ;
- (5) to authorise the issue by the Committee of Management of mortgage bonds ; and
- (6) to decide appeals against the decision of the Committee of Management.

36. The business transactions of the Association shall be supervised by the Registrar of Co-operative Societies.

37. The Registrar has the right—

- (1) to require the summoning of a general meeting ;
- (2) to be present at the proceedings of the general meeting as well as at the meetings of the Committee of Management, and the Board of Supervision ; and
- (3) to inspect the books and the cash balance of the Bank at any time.

38. The accounts of the Association shall be audited at least once a year by a duly certified auditor or by an officer deputed by the Mysore Government.

39. All other matters concerning the organization and the working of the association, as well as the remuneration, if any, which the Committee of Management, the Board of Supervision, the confidential agents and the auditors are to receive shall be fixed by Regulations to be framed by the Association.

The Regulation shall require the approval of the Government of Mysore.

40. A reserve fund shall be formed by the Association to serve as a cover for any deficit in the balance sheet. To this shall be carried—

- (1) a sum not less than 10 per cent of the net profits of every year ;
- (2) the interest on the capital of this fund ;
- (3) amounts not claimed ;
- (4) produce of drawn and expired mortgage bonds.

41. A special amortisation fund shall be formed for mortgage bonds.

42. Except so far as is expressly provided for in these bye-laws, the Association shall be bound by the provisions of the Law on Co-operative Societies in Mysore.

INDUSTRIES AND COMMERCE.

The Ideal Factory.

Mr. B. Seebohm Rowntree has outlined—this he did in a speech at Leeds—what he has described as “his ideal factory.” This ideal factory would be built outside the town amid gardens and playing-fields. As to its interior, he would get rid of any institutional or “workhouse” appearance; there would be special attention to lighting, ventilation, and the reduction of noise and vibration; there would be the best canteen to be had for money; a works doctor in daily attendance, with an oculist, dentist and nurse, and rest rooms wherever necessary.

The hours he would work would be the ascertained minimum number that would enable him to produce the necessary output.

“As to my relations towards trade unions,” said Mr. Rowntree, “from the outset I shall regard them as my friends. I shall encourage all my people to join their trade union, and they shall have half-an-hour each week for the collection of contributions. With regard to the Government of my business, I shall try to gather round me the very best men I can lay hands on, but I will only get men who have the same ideals about industry. I am going to keep the financial and commercial side of this business in my own hands, but so far as industrial administration is concerned I am going to ask my workers to co-operate to the fullest possible extent.

“For my managers and foremen I am only going to have gentlefolk, gentlemen and gentlewomen from whatever walk of life they are drawn. I am going to tell them they are to be leaders of men, and to remind them that they can only lead from the front; they drive from behind. I shall encourage overlookers and foremen to form an association amongst themselves. With regard to the workers, I will start straight away to place responsibility upon them by building up a system of councils. As to payment there should be a basic wage and a secondary wage. That basic wage should enable a man to live, marry, and bring up a normal family in a decent home, while leaving a margin for contingencies and recreation. Beyond this there would be an output bonus.”

A LONDON EXHIBITION IN 1921.

The desirability of holding in London in the summer of 1921, a great exhibition of the manufactures and products of the Empire, in order to promote the extension of Imperial trade, was discussed at a luncheon at the British Empire Club on May 20. The proposal received the support of representatives of the Dominions, and it was decided to approach the Government in order to get the approval and afterwards to form a large and representative committee to organize the work. Lord Sydenham, Chairman of the British Empire League, presided.

The Chairman recalled that in 1903 the British Empire League passed a resolution declaring that it was desirable that an imperial industrial exhibition should be held; if such an exhibition was desirable then it was essential now. It was certain that such small undertakings as the Leipzig and Lyons Fairs had helped to create new business on a large scale, and, though the first of those fairs had shrunk into nothing during the war the second had made a most remarkable advance. We had won the war because we had been a United Empire, and it was, necessary that we should have the same unity for the reconstruction which lay ahead. Within the Empire there were vast resources still undeveloped, and it was to them that we must look to restore the badly shaken fabric of our industrial life. The prosperity of the Empire and the welfare of its citizens depended on our oversea trade, and if we could not retain and increase that we should be faced before long with very grave economic difficulties. We had to meet competition, especially that of the United States and Japan, but he was confident that with a united Empire we should be able to do so. He moved a resolution stating that it was desirable to hold a British Empire Exhibition in London in 1921, as an expression of Imperial unity, and as a means to the promotion of commerce and industry throughout the Empire.

Lord Blyth, seconding the resolution, said he had acted as the organizing chairman of the Franco-British Exhibition and also of the Japanese Exhibition. Lord Hardinge had told him during the war that the friendly feeling between France and Japan and this country had been in no small degree due to those exhibitions, and Mr. Balfour, in a letter to him on the subject, had said that the successful co-operation of French and British in the war was due

very largely to the beneficial effect of the Franco-British Exhibition. If those exhibition had done so much to bring nations together, he thought an exhibition on similar lines would do much more to bring the Empire together.

Mr. Hughes said that the depth of the ignorance of the different parts of the Empire about each other was rather appalling and the desirability of holding an exhibition of the kind proposed was obvious, for the latent resources of the Empire were unlimited. He did not wish to refer to politics, but he felt bound to point out that trade flowed along certain well-defined channels, and was easily diverted. One of the surest means of binding the Empire together was to ensure that trade should be induced to run along certain channels. What precisely the policy of the Government of this country was with regard to Imperial trade he did not know, not could any Englishman present tell him. A people scattered over the whole earth, which was the trustee of some of its most fertile portions, had the means to make itself great and strong. But if that people was inclined to drop the substance for the shadow to pursue fleeting phantoms, and to try to run with the hare and hunt with the hounds it was doing the impossible. The electors of Great Britain had to make up their minds what they really wanted. If they wanted Empire there was a clear way to get it; if they did not want Empire there was a clear way to lose it. He was strongly of opinion that an exhibition such as that proposed would be one way of convincing the doubting Thomas all over the Empire—the people who lived in a world of their own, and when they spoke of Empire meant Canada, Australia, or England rather than the great whole that was within their grasp if they had the courage to put out their hands.

Sir Joseph Ward believed that the fight for supremacy after the war was going to be as great as the fight for supremacy on the battle-fields, and it was to the Mother country that the Oversea Dominions looked to give them a lead. They were on the eve of chaos in the commercial world. The fact had to be faced that, though we were friendly with the United States and Japan, they had been gaining new trade since the beginning of the war. They had secured the trade which Germany had before the war, and much of that which this country had. It was only by co-operation and freedom from Government control that successful competition could be organized. He believed that the exhibition proposed would be a great stimulus to the development of Imperial trade.

Sir G. Perley said it was important that Imperial trade should be developed, for the war had shown

the importance of keeping our resources in our own hands.

Sir E. Bowring said that Newfoundland was prepared to do everything possible to make the exhibition a success.

Sir R. Hadfield thought it might be difficult to hold an exhibition without the help of other countries, though he agreed that, if it could be confined to the Empire, it would be more satisfactory.

Lord Southwark said that, as president of the London Chamber of Commerce at the outbreak of war, he had learned how important it was that there should be full knowledge of the trade of the Empire. There was knowledge that we should have possessed which we had not possessed. We had at that time a machine in this country capable of most important and necessary work, but the only man who could work it was a German, and he had gone.

The resolution was agreed to.

COTTON INDUSTRY RESEARCH.

Wide Development Scheme.

The British Cotton Industry Research Association was formally constituted at a meeting in Manchester on May 23 after-noon of the signatories of the memorandum of association. The framing of the constitution has occupied many months, and the early hope that the Cotton Research Association would be the first to get to work under the Government's scheme was disappointed long ago.

Exceptional difficulties have hindered the labours of the provisional committee. Conflicting policies have had earnest advocates, and if the committee has moved deliberately there has been the gain of fuller agreement to set against the loss of time.

The objects of the Association are far-reaching. Every branch of the industry from the cultivation of the raw material to the production of the manufactured articles, is within their scope, and the Association will not only concern itself with materials and methods and machinery, but it will also endeavour to enhance the efficiency and the happiness of the workpeople.

The great sweep of its prospective activity is indicated by the following statement of its aims:

"To promote research and other scientific work in connection with the production of cotton and its utilization in industry and generally, in connexion

with any branch of trade or commerce, producing, using, and handling cotton, whether in a raw or manufactured state, or producing machinery, accessories, substances, or appliances, to be employed in the production of cotton or its utilization in industry, and to provide and spend money as may be thought necessary or convenient for these purposes and to encourage and improve the education of persons who are engaged, or who are likely to be engaged, in the industry."

In pursuit of these purposes it will employ scientific or skilled persons and maintain scholarships and bursaries for the instruction and support of scholars in research work, or of persons engaged in studying the principles involved in any of the industries using cotton. As soon as possible a Cotton Research Institute will be erected in the neighbourhood of Manchester and here the Association will have its own chemical, physical, textile, and other laboratories. But that is a development not immediately practicable, and in the meantime it will be necessary to make use of existing institutions, such as the Manchester University and the College of Technology.

It will be possible almost at once to found a good textile library and a bureau of information to which "any member of the Association can bring any inquiry relating to his branch of the industry with the assurance that if the information is any where available he will be able to obtain it there."

A COTTON MUSEUM.

It is also proposed to establish a Cotton Industries Museum. Ultimately the Association may have not only its institute and laboratories, but also its own workshops and experimental factories, but pending the day of those greater things it will make arrangements for its experiments on a manufacturing scale to be carried on in the works and mill of its members. It is also proposed to establish stations in the cotton fields of the Empire for the investigation of the growth of cotton and the careful and complete study of the scientific problems which arise.

Power is taken to co-operate with other associations and institutions in the prosecution of either scientific or industrial research work, and to encourage the discovery of and investigate and make known the merits and nature of inventions, improvements, methods, operations, processes, designs and materials, and to acquire any patents or licences relating to any such inventions; or to acquire and register any standardization marks on designs, and to use the results of research to benefit the Association and its individual members, both by the prior distribution of knowledge and by the preferential user of any patents or processes.

THE BENEFITS FROM RESEARCH.

It will be possible for special research or other scientific work to be done for particular members or groups of members of the Association upon payment of the full cost of the work, and the use of the results of this research can be restricted to those who initiate it. This important provision will govern all the activities of the Association, whether private or general. "That no invention, improvement, method, operation, process, design, material, patent, licence or trade mark, which may become the property of the Association shall be sold, disposed of, or turned to account, unless reasonable precautions have been taken to prevent the benefit of the same accruing to foreign competitors."

It may be mentioned in this connection that the Articles of Association contain provisions to ensure the limitation of membership of the Association to British subjects or to corporations and firms which satisfy the description of British, by being as to the constitution of the governing body, or the number of the partners, and as to the amount of capital, at least three-fourths British.

It is also stipulated that the business must be mainly, controlled in and from some place in the Empire. No person other than a British subject, resident in the United Kingdom will be qualified to a member of the Council of the Association.

THE FINANCIAL BASIS.

The financial estimates are necessarily, at this stage, rather vague. It is calculated that for the first five years the expenditure will not exceed £ 20,000 a year. A liberal contribution from the Government is expected. The Advisory Council of Scientific and Industrial Research have promised that if the Association raises £ 5,000 a year for five years, it will recommend the Committee of the Privy Council to contribute a similar amount for the same period, and that if the Association raises more, the Government contributions will also be increased, though not at the same rate.

Each firm or association must pay an entrance fee of £ 5, which will cover what is called the initial period of the formation of the Association. Subsequently there will be an annual levy based upon the capital employed in the various concerns as follows :- Up to £20,000 capital. £1 levy : up to £4,000 capital. £ 2 : up to £60,000. £ 3 : up to £ 100,000. £ 5 : up to £ 200,000 : up to £ 500,000 £ 25 : up to £ 100,000, £ 50 ; and where the capital exceeds a million, the unit of assessment will be £50 for each million or part thereof.

Reckoning on the assumption that half the smaller firms and two-thirds of the larger ones and all the

large combines will join the Association it is estimated that the produce of the first levy will be £8,000. The addition of a Government grant of £ 5,000 will bring the year's income to £13,000. The anticipation is that in none of the first five years will the levy exceed two or at the most three times the amount of the first levy.

The Federation of Master Cotton Spinners Association is joining the Research Association in its corporate capacity, and all the members of that Federation will be individual members of the Research Association upon payment by the Federation of a levy at the rate of one-tenth of one farthing per spindle, calculated on the total of the spindles, included in the Federation, looms and other varieties of machinery being assessed in proportion.

THE MEMBERS OF THE FIRST COUNCIL.

The first Council will consist of 25 members of whom 13 will be appointed by the signatories, 5 will be nominated by the Federation of Master Cotton Spinners' Associations, three by the Cotton Spinners' and Manufacturers' Association, 2 by the Employers' Federation of Dyers and Finishers and 2 by the Federation of Calico Printers. The Committee of the Privy Council may appoint 5 other members, whether members of the Association or not, to be additional members of the first council. Subsequent Councils will consist of not less than 20 and not more than 50 members.

One of the first important duties of the Council will be to appoint a director, who will be responsible for the whole internal management of the Research Institute and the direction of all research. With the permission of the Council he may also advise and assist individual members in regard to technical difficulties or suggestions for improvements, and in such matters the director shall be entitled to receive communications given to him in strict confidence without reporting them to the Council.

BRITISH INDUSTRIES.

An Imperial Fair.

The Board of Trade has issued the following prospectus :—

This the first year of peace releases the British Industries Fair from the restrictions which the manufacture of munitions of war has imposed upon it. The British Industries Fair of 1920 and the Fairs of the future will be on a scale commensurate with the magnitude of British industry. The knowledge that the country's first duty was to produce munitions led the Board of Trade to prohibit firms

who were mainly engaged in the production of war requirements from exhibiting at Trade Fairs and practically confined the Fairs to a few non-essential trades. The extent to which this policy was carried out is shown by the fact that even such articles as cutlery, electroplate, clocks and jewellery have been excluded from the last four Fairs. But to-day the position is changed, and the contemplated development is able to take place, with the result that it has been found necessary to provide as a home for the Fair in London the Crystal Palace, the largest exhibition building in the world. And already there is grave doubt that this building—gigantic as it is, will prove too small unless special additions are made to it.

The three Fairs, though held in different towns (London, Birmingham and Glasgow), are in reality one Fair. The London Fair is directly organised by the Board of Trade, while the Fairs in Birmingham and Glasgow are organised by the Municipalities of the respective cities under the auspices and with the support of the Board. An important point in the organisation of the three Fairs is that they are held concurrently, each Fair representing a specified group of industries and no one industry being permitted to exhibit at two Fairs.

Under the new scheme which thus comes into being many trades which in the past have been unrepresented by a Trade Fair have an opportunity of exhibiting their productions, and foreign buyers will have an opportunity of seeing at one time an enormous range of the country's productions. The success which has attended the five Fairs already held in London has satisfied the Board of Trade as to the correctness of the system on which they have been organised and the coming Fair, though so vastly increased in scope, will be run on the same lines.

The British Industries Fairs are not Exhibitions. They are Trade Fairs to which admittance is restricted to *bona fide* trade buyers seriously interested in the participating trades, and admission is by invitation only. Participation in the Fair is confined to British manufacturing firms which shall be deemed in this instance to be firms which shall be deemed in this instance to be firms and head offices are situated within the British Empire and which are not controlled by foreign interests. Exhibitors are not permitted to exhibit goods other than those they actually manufacture. The result is that buyers who visit the Fair know that no article shown on an exhibitor's stand can be purchased elsewhere, in the Fair, while the exhibitors on their side can rely on the fact that all visitors are trade buyers. So organised, the British Industries Fair is immeasurably more valuable to both exhibitors and buyers than a Fair in which the same article may be

shown upon many exhibitors' stands and where the visitor may spend much of his time in comparing the different prices at which it can be purchased. By excluding the general public and restricting admission to trade buyers the exhibiting manufacturer is saved the great waste of time in which he would be involved by exhibiting and explaining his wares to persons who had no other motive for visiting the Fair than that of curiosity. In these two particulars the organisation of the British Industries Fairs shows a great advance upon other Fairs.

Another point in which the British Industries Fairs are an advance on the Fairs which have been organised in various towns on the Continent is that participation in the Fairs is restricted to manufacturers of goods which are really suitable for inclusion. At some of the Fairs which have been held on the Continent such articles as railway engines, big guns and other products of engineering works have been exhibited, although it is clear that they are not articles which are purchased by the trade buyer in quantity for stock and resale. An examination of the schedule of the trades included in the British Industries Fair, 1920, will at once show that participation is confined to goods which are such as would be purchased for re-sale by wholesale and retail tenders.

For manufacturers, participation is both cheap and simple, since, although the Fairs are financially self-supporting, the making of a profit is not aimed at by the Board of Trade, and because, so far as possible, each exhibitor is allowed to exhibit in the form he prefers. At no other Fair can an exhibitor place his samples before the world's buyers for so trivial a sum as at the British Industries Fair. Many exhibitors on small stands measuring 6 feet by 6 feet have been able to display their samples for a total sum of less than £10, and many exhibitors have found that their total expenses did not amount to 1 per cent, on the orders which they booked. In one case which has come to the Department's knowledge an exhibitor's total expenditure was less than $\frac{1}{2}$ per cent.

Applications for space from eligible manufacturing firms in India must be made before the 1st September, and can only be received through—H. M. Trade Commissioner, McLeod House, 28, Dalhousie Square, Calcutta.

POSSIBILITIES OF THE INDIAN CHEMICAL INDUSTRIES.

A paper by Mr. H. N. Morris (Technical Chemist) on "The Industrial Development of India, with special reference to the Chemical Industries," was read at a meeting of the Manchester Section of the Society of Chemical Industry held on 4th April, 1919.

Mr. Morris stated that the industrial development of India in the past had been retarded by the absence of plentiful supplies of coal, but with the utilisation of other sources of power—oil fuel from Persia and hydro-electric power—and the increase in the production of coal, the position had undergone a great change. Oil fuel had been used for steam raising purposes in Bombay with success, the efficiency being about twice that of coal. Several water-power undertakings were now in operation, the most important being the Tata Hydro-electric Power Supply Company, which was supplying current at the rate of 0.55 anna per unit, including the provision of electrical installation, and day and night loads at a lower rate. The last report of the Tata undertaking stated that forty-one mills in and around Bombay were being supplied. The present B. H. P. of motors in service was 45,000, in addition to 5,500 H. P. supplied to other consumers. Further extensions by the company were in progress. Another undertaking, the Koyna River scheme, was estimated to give as much as 300,000 H. P. for 8,000 hours in the year.

Dealing with the present position and prospects of the heavy chemical industries of India, Mr. Morris said that salt, a basic raw material, was produced in large quantities, about three-fourths of the annual consumption of between 1,750,000 and 2,000,000 tons being of domestic production. Two-thirds of the total output was derived from the solar evaporation of sea-water, and the remainder partly from rock salt in the Punjab and partly from salt lakes in Rajputana. Unfortunately, Bengal, where other conditions were favourable to the manufacture of heavy chemicals, was compelled to import salt, but, in the author's opinion, the manufacture of this material, accompanied by the recovery of bromine and magnesium and potassium chlorides, was a practicable proposition. Notwithstanding the large and cheap supplies of salt manufactured in various parts of the country, no important alkali works were in existence. Several plants were producing caustic soda—those of the Eastern Chemical Company, Bombay, and the

Magadi Soda Company, Calcutta,—but they were only for the treatment of imported soda ash. No attempt had yet been made to manufacture either caustic soda or carbonate of soda from native salt. Another important product, sulphuric acid, was being produced satisfactorily by the Eastern Chemical Company; Waldie and Co., Calcutta; Parry and Co., Madras; and the Burma Chemical Industries, Rangoon. In addition, the Bengal Steel and Iron Company, Kulti, and the Tata Iron and Steel Company, Sakchi, manufactured sulphuric acid for the conversion of ammonia from their by-product plants into sulphate of ammonia. Up to now the manufacture of sulphuric acid on a large scale had been retarded by the absence of sources of cheap sulphur, manufacturers having to rely upon the importation of Italian and Japanese sulphur. In this respect the author hoped that the situation would be relieved by the utilisation of Burmese zinc concentrates, the development of known sulphur deposits within easy reach of the West Coast of India, and the treatment of native copper sulphide ores. The Eastern Chemical Company and other firms who had supplies of sulphuric acid available were making hydrochloric and nitric acids in sufficient quantities to meet the immediate demands of the country.

The writer next referred to the iron and steel industries of India, which had shown remarkable development during recent years, the most important concerns being the Bengal Steel and Iron Company and the Tata Iron and Steel Company. The yearly production of coke-oven by-products by the Tata Company, when the whole of the plant now under construction was completed, was expected to be 2,300,000 gals. of crude naphtha, 10,000 tons of sulphate of ammonia, and 40,000 tons of tar. The large amounts of benzole, toluol, naphtha, and creosote available from the recovery plants at these works opened up possibilities for developments in chemical manufacturing, and the companies were quite alive to the fact. Arrangements were being made for the establishment of a cycle of industries around the Tata's works at Sakchi, including spelter manufacture, galvanised iron, sulphuric acid from concentrates, benzole purification, and general coal-tar products manufacture, and the utilisation of the slags.

In the development of the basic chemical industries fertilisers would undoubtedly play an important part. The question was, how far could India supply herself with the required chemicals? Potash in the form of nitrate was an old Indian industry, and in the last ten years the yearly production had varied from just under 15,000 tons to 25,000 tons. That might be increased possibly by concentration of the salt manufacture and the recovery of potash from the mother

liquors, and also from the blast-furnace gases, but nothing had yet been done in those directions. Phosphates presented a difficulty. Some of the crops in India, notably indigo, required superphosphates, and so far no cheap source of manufacture had been found. No good quality of phosphate of lime has been found in India which would be suitable for the manufacture of superphosphates. Most of the phosphate discovered had been in the form of nodules containing a high percentage of carbonate, and thus quite unsuitable for treatment with sulphuric acid. Some large deposits of mixed phosphates of lime and aluminium were said to have been discovered in Bengal, but so far as he had been able to ascertain, those had not been suitable for treatment with acid. There were, however, excellent deposits on the Red Sea coast that could be shipped at a low cost to the West Coast ports, which would place India in as favourable a position as most countries, and better than either Japan or European countries, which had to import their phosphate rock. The difficulty with regard to sulphuric acid, already referred to, could only be remedied by cheap sulphur or sulphur ore. Ammonia was available in the form of sulphate of ammonia from the coke-ovens, and would be available in increasing quantities from that source, but would be only a fraction of what India would require when the advantages of fertilisers were understood. Nitrates, with the exception of the comparatively small quantities of nitrate of potash obtained from earth deposits, would have to be imported until it was possible to produce economically by the fixation of atmospheric nitrogen.

Until the Tata Hydro-electric Power Company had proved that power could be produced economically from the Western Ghats, the establishment of industries requiring chief electricity for their success could not be considered. The conditions were now changed. The production of hydro-electric power at such a low cost as had been proved possible made practicable a number of electro-chemical industries which would not otherwise have been considered. These included the manufacture of aluminium from bauxite, which was plentiful and of good quality; the decomposition of salt and the production of soda compounds; and lastly, but of greater possibilities, the fixation of atmospheric nitrogen, and the production of ammonia and nitrates. All these were now practicable propositions for India. So far as the author was able to judge, Switzerland, Norway, or even Niagara could none of them compare with such schemes as the Koyna River and other water-power undertakings in India.

Twenty years ago India, in addition to supplying its home requirements, exported natural indigo to the value of 3½ millions sterling per annum, but

prior to the war that had gone down to £142,000, owing to the competition of the German synthetic product; in 1916 it had risen to £1,385,000 and 1917 was practically the same. It was now a question as to whether the competition of the synthetic product would drive the natural indigo from the market. In 1917, Mr. Morris visited one of the best conducted of the indigo works in Behar and discussed the position and prospects of natural indigo with Mr. W. A. Davis, the Indigo Research Chemist, and Dr. Hutchinson, of the Pusa Agricultural College. It had been definitely established that by the use of superphosphate as a fertiliser, the yield of indigo per acre could be increased both in quantity and quality. Unfortunately, superphosphate was not yet made on a large scale in India, and there had been difficulties in obtaining supplies during the war. It was essential that the fertiliser should be manufactured in India, and supplies assured for such industries as that of indigo if they were to have any chance of success. Great improvements had been shown to be possible by means of scientific control of the fermenting process, enabling the manufacturer to obtain increased yields of colour from the leaves. It was also considered necessary that natural indigo should be standardised and sold in a paste form and that this standardisation should be done in India for use both in the country itself and in those other markets where a standardised paste was preferred. It had been impossible to carry out all the proposed improvements during the war, but if they were carried out, and if the planters worked together, he thought, with Mr. Davis, that natural indigo would be able to put up an interesting fight with the synthetic dye.

Various proposals had been made for the establishment of wood-distillation works in India, but nothing of value seemed to have been done. There was a certain amount of risk in any such undertaking, as the products, such as wood naphtha, tar, and acetate of lime, would have to be placed on the market, and the demand for them in India had not been of any importance in the past. A market would have to be created. The charcoal produced would have to pay heavy carriage charges if the local market did not consume all that was manufactured. A distillation plant in connection with a large saw mill, where the waste timber and sawdust were distilled, would certainly have a chance of success if favourably situated for the distribution of the charcoal. In 1916, 286 million cubic feet of timber were produced in India, but that was only a fraction of what might be expected from the 249,000 square miles which the Forest Department controlled. Waste vegetable products, such as the paddy husk, could also be carbonised where produced and give the same

products, if the local demand for them or the prices obtainable for export justified the necessary capital outlay. The conversion of the 50 per cent to 60 per cent of cellulose contained in timber into dextrose and alcohol economically was said to be now accomplished. That opened up new possibilities of development in the manufacture of a cheap methylated spirit for domestic use, but the writer did not think that it was likely to become a serious competitor of kerosene and petrol, as some people suggested.

From what had been said, it was evident that if only a fraction of these extensions or developments of chemical industries were carried out—and for the most part they were sound in principle,—there would be a marked increase in the demand for trained chemists, engineers, and foremen. The question of education, and especially the provision of technical education of an advanced kind, had naturally had the serious consideration of the Indian Industrial Commission. In the past the system of higher education in India, as pointed out by the Commission, had encouraged literary and philosophic studies to the neglect of those of a more practical nature. It was not until the beginning of this century that after an Education Conference at Simla, called by Lord Curzon, drastic reforms were carried out in higher education generally, and in technical and industrial education in particular.

DISCUSSION.

The discussion was opened by Mr. D. T. Chadwick, I.C.S., (Indian Trade Commissioner in London). Mr. Chadwick said that the absence of a real trade policy in the past had, had something to do with the backward state of Indian industries, and the feeling of dissatisfaction created had resulted in the appointment of the Indian Industrial Commission. A great need existed at the present time for the development of the heavy chemical industries in India, as upon these depended so many other branches of industrial activity.

Mr. J. Allen said that India was provided with enormous natural resources, and the sooner that fact was realised the better. Many of the products previously imported into India would in the future be produced in that country, and those who recognised the position the soonest would so modify their businesses as to be in a position to take full advantage of any opportunities that presented themselves. As an example, he stated that much of the oil seed that was now exported from India would be dealt with in that country, and an export trade started in the finished products.

Mr. Rawson, speaking from a long and intimate association with the Indian indigo industry, said that having regard to the quantities of synthetic indigo

now being produced in the United Kingdom and America, as well as in Germany, and to the excellence of the product, he could not see how natural indigo was going to compete.

Mr. Khotibasker, referring to Mr. Morris's remarks regarding the supply of phosphate for the manufacture of superphosphates, suggested the use of bones. In his reply later, the author stated that bones had been used for that purpose by the undertaking in India with which he was associated, but the high cost of the bones and of the necessary sulphuric acid rendered the process impracticable so far as India was concerned.

Mr. Fernandez said he had found that the Indian workman could adapt himself very well to the difficult chemical processes in operation at some of the works with which he was connected when in India.

Mr. G. Gunn said that the only way in which the alkali industry in India could be developed along modern lines was by the electrolytic processes for the decomposition of salt. If the alkali industry were so developed, other industries, such as the manufacture of soap, paper, etc., would receive a very considerable impetus.

CHEMICAL INDUSTRIES.

Reported Discovery of a New Alkaloid.

The Chemists of the United States Department of Agriculture, in conjunction with the Bureau of Plant Industry, claim to have extracted a new alkaloid from the plant called in Mexico "Gobernadora," the *Covillea tridentata* of botanists, which grows in the semi-arid districts of Mexico, New Mexico, etc. The odorous characteristics and medical properties of this plant have long been known to natives and explorers, but it is only just recently that the presence of a new alkaloid has been recognised says the *Board of Trade Journal*. The possibilities of this alkaloid in chemical and pharmaceutical preparations are now being ascertained.

"Gobernadora" is a shrub which grows in vast quantities in the States of Zacatecas, San Luis Potosi, Coahuila, and Durango, a little north of the Tropic of Cancer, in about the same zone as guayule is cultivated. It grows to a height of from one to one-and-a-half metres. It is estimated that a million

tons of ashes, rich in potash, can be produced yearly from the green shrub now growing. It takes about one year for the plant to develop from same roots after cutting. The leaves smell of idioform.

It is stated that in 1912 two German chemists obtained permission to make experiments on one of the haciendas situated in the States of Zacatecas and San Luis Potosi. Permission was granted on the understanding that they would furnish an exact report of their findings. The chemists made extensive experiments and disappeared without furnishing the report. Investigations indicate that after experimenting with several plants and shrubs they burned "Gobernadora" and apparently found satisfactory results in the ashes of this plant, as they departed immediately.

STATISTICS OF THE ELECTRIC POWER INDUSTRY.

According to a Report issued by the Department of Commerce, the electric light and power stations in the United States during the year 1917 generated more than 25,000,000,000 kilowatt hours of electric energy, producing an income of more than a half billion dollars, and gave employment to more than 100,000 persons, whose salaries and wages aggregated nearly 100,000,000 dols.

The output in 1917 was more than double that for 1912 and more than quadruple the output for 1907. The report covers both commercial and municipal plants, but does not cover electric plants operated by factories, hotels, etc., which generate current for their own consumption, plants operated by the Federal Government and State Institutions, nor plants that were idle or in course of construction.

The figures show great strides in the industry during both of the five-year periods, 1907-1912 and 1912-1917. The output of electric energy by the light and power stations increased at a considerably greater rate and their expenses at a slightly greater rate than their income, and the rate of increase in the number of persons employed was much smaller, particularly during the later five-year period, than that in the amount of business done.

ESTABLISHMENTS.

The total number of establishments increased from 5,221 in 1912 to 6,541 in 1917, the latter comprising

4,224 commercial and 2,317 municipal establishments. The increase indicated by these figures is somewhat misleading, since 2,296 new establishments came into existence between 1912 and 1917, but as a result of combinations in the commercial systems and various other changes, the net increase was only 1,320, comprising 565 commercial and 755 municipal stations.

INCOME AND WAGES.

The total income of the stations in 1917, of which 95.3 per cent represented electric service, amounted to 526,886,408 dols., an increase of 74.3 per cent as compared with 1912, and of 200 per cent as compared with 1907. The total expenses were 427,136,049 dols., or 82.1 per cent more than in 1912, and 218.3 per cent more than in 1907. The employees of the light and power stations numbered 105,546, an increase of 33 per cent over 1912 and of 121.6 per cent over 1907 and their salaries and wages aggregated 95,239,954 dols., an increase of 55.7 per cent as compared with 1912 and of 168.9 per cent over 1907.

HORSE-POWER.

The total primary power in 1917 amounted to 12,857,998 horse-power, an increase of 70.8 per cent. as compared with 1912 and of 213.7 over 1907. Of this power nearly two-thirds—8,389,389 horse-power—was derived from steam; almost one-third—4,251,423 horse-power—from water, and the remainder—217,186 horse-power, or less than 2 per cent—from internal-combustion engines. The corresponding proportions for 1912 and 1907 differed but slightly from those just stated. The average horse-power per steam engine shows a very great increase—from 334 in 1907 to 631 in 1912 and to 1,124 in 1917. The average horse-power of the water wheels also shows a marked increase from census to census, but in the case of the internal-combustion engines there has been a decline. The total dynamo capacity, 9,001,872 kilowatts in 1917, represents an increase of 74.3 per cent as compared with 1912, and 232.2 per cent over 1907, these rates of increase being slightly greater than the corresponding ones for total primary power. The output of electrical energy aggregated 25,438,611,417 kilowatt hours, an increase of 119.9 per cent for the period 1912-17 and of 333.0 per cent for the decade. Of the 6,541 establishments reported for 1917 those which purchased all their electric energy from other establishments numbered 1,422, as against 507 in 1912 and 227 in 1907.

The figures indicate that the arc lamp for street lighting is being fast superseded by the incandescent of various types. The former class of lamp decreased in number from 348,643 in 1912 to 256,838 in 1917, the reduction amounting to more than one-fourth; while during the same period the number of incandescent lamps more than doubled, increasing from 681,957 to 1,389,382.

SERICULTURE.

Progress in Kashmir.

The following are extracts from the Report on the Administration of the Jammu and Kashmir State for the Sambat year 1972 (1915-16), recently issued:—

(A) KASHMIR.

The year opened under the depressing conditions described in last year's report, but in July a remarkable revival began, owing to various causes, such as the War, the shortage of the European crop, heavy purchases by America, etc., and prices in the next few months rose to unexpected heights, until about the end of the year (April, 1916) records were reached. There has since been a slight reaction, but prices are still higher than they have been at any time since 1893, though not much higher than in 1907, the last year of high prices. The enormous increase in freights and insurance rates, especially the former, was a serious drawback, but a large amount of silk was sold at excellent prices, and the year has been a prosperous one for the Sericulture Department.

The cocoon crop was 33,862 maunds, very little more than in Sambat 1971, though the amount of seed was somewhat larger. This is again rather a poor result, due chiefly to a considerable part of the seed having been delayed in transit owing to the War, and also to unfavourable weather and cholera during the latter part of the rearing season. The attempt to introduce rearing in Skardu, having continued for several years, has proved a failure and has been given up.

Local seed for almost the first time gave poorer result than imported, 31 seers 8 chataks against 36 seers 9 chataks per oz. The amount of seed used was 4,427 oz. (12 per cent), against 3,726 oz. (10 per cent) in Sambat 1971. None of the new filatures was completed during the year, and it is, therefore, very creditable that the cocoons reeled rose from 7,883 to 19,003 maunds: this was due to the mild winter which rendered it possible to keep the filatures at work throughout the year, hitherto supposed to be impracticable with the present filatures, while towards the end of the year nightwork was introduced with complete success in order to meet the increased demand. The total outturn was 1,69,921 lbs. 9 oz. 11 dr. compared with 78,323 lbs. 10 oz. 11 dr. in the preceding year. The average outturn of silk No. 1 decreased from 6 lbs. 13 oz. 9 dr. last year to 6 lbs. 6 oz. 8 dr., while that of inferior silk and

waste increased from 3-2-9 to 3-13-7. Considering, however, that more No. 2 cocoons were reeled during the year, and the silk reeled from them was shown as No. 1, the outturn seems satisfactory.

Kashmir appears to have solved quite satisfactorily the difficult problem of electric heating of the basins, and is in this respect in advance of the rest of the world; in the new filatures steam heating has been retained for the cooking basins, for which electricity was found unsuitable, and for the spinning basins, power will be supplied at the cheap rate of Rs. 22-8 per basin per annum. It will be very interesting to see the effect on the quality of the silk produced in the new filatures when they are ready.

The attempt to establish business relations with Siam was fairly successful; more important was the endeavour to obtain a footing on the American market, as to which negotiations were in progress. At the same time, the Indian market was not neglected. In Europe, the record price of twenty-one shillings per lb. was secured; the previous highest price was a little over seventeen shillings in 1907. The average price for the year, however, was naturally much lower, being 12s. 8d. per lb. The result of the year's working was a profit of Rs. 9,58,010 which has been exceeded only once before. The net profit to date is Rs. 68,78,080.

(B) JAMMU.

The industry was subject to the same conditions as have been mentioned above in regard to Kashmir, namely, a very inactive market at first, followed by an extraordinary rise in prices and an equally extraordinary rise in freights and insurance, both of which were in some cases ten times as high as in July, 1904.

Silk-rearing has now extended to all tahsils of the Jammu Province, except Akhnur, Samba and Jasmargharh. Progress in this respect is considered to have been rather too rapid, adequate supervision in a difficult country like that of the Jammu Province being far from easy. The quantity of seed distributed rose from 4,014 oz. last year to 4,055 oz., but the outturn of cocoons fell from 29'9 to 28'2 seers. Unfavourable weather and the damage done to the seed in transit from Europe owing to the war were the causes responsible for the decrease in outturn. Jammu is less fortunate than Kashmir in regard to seed distribution, official supervision, climate, and the disposition of the people, but the yield hitherto has been less than it ought to be even under such conditions, and it is to be hoped that future years will show better average results.

In the filatures, labour continued to be a difficulty. The factory worked 300 days (29,010 basins) against 264 days (31,585 basins) in Sambat 1971, the average attendance falling from 255 to 221. The outturn per maund reeled was 5 lbs. 3 oz. of No. 1, and 7 lbs.

13 oz. inferior and waste, against 5 lbs. 1 oz. and 6 lbs. 15 oz. respectively. The total outturn of silk No. 1 rose from 6,691 lbs. 3 oz. last year to 7,814 lbs. 5 oz. and that of inferior silk and waste, from 5,428 lbs. 8 oz. last year to 8,855 lbs. 10 oz. Reports from Europe show that the quality of silk has also improved.

The superior silk was nearly all exported, Indian sales being confined chiefly to cocoons and puda. The year closed with a small balance of No. 1 and a largely increased balance of waste of different kinds, which is less able to bear the increased charges for freight and insurance. Prices realized were satisfactory, ranging from 11'3 francs per kilo. in January to 52'50 francs per kilo. in March. The Preliminary Balance Sheet shows a profit for the year of Rs. 42,107 a very satisfactory result; and a total loss to date of Rs. 52,393, which is really not so much, as the stock on hand is worth more than its book value.

MULBERRY CULTURE.

Steps are being taken to extend nursery work and to propagate early budding varieties as opportunity offers. In Jammu, the number of trees transplanted fell from 10,000 last year to 5,850 and these suffered from unfavourable weather, but in Kashmir, the number of plants given out showed a very considerable advance (33,398) on the 14,000 trees distributed last year. The total number of trees planted to date in Kashmir amounts to 2,45,215 of which 68'98 per cent is reported to have survived. The net income of the department from sales of wood and fine was Rs. 5,813, as compared with Rs. 5,700 in the preceding year. It is to be regretted that the people still take very little interest in mulberry planting, although the Durbar has done much to encourage it. This is chiefly attributed to the restrictions relating to the mulberry trees which have proved disadvantageous to sericulture as well as harassing to the people. The removal of all restraint is, however, impossible. As the result of further consideration it is now suggested that the concessions already sanctioned regarding payment to Zamindar of the value of dry mulberry wood removed from the land which has remained inoperative so far, should, in future, be allowed to them in practice, and the people in a few villages or small blocks of villages, when they have taken even a slight interest in mulberry plantation, should, as a tentative measure, be released from the mulberry rules as regards trees on their own lands.

SILK INDUSTRY IN SWITZERLAND.

According to reports received from reliable sources, the silk industry in Switzerland is in a precarious state, says the *Journal of the Board of Trade*. This is particularly the case with regard to the silk textile trade in the district of Zurich and the silk ribbon trade of Basle.

These two trades combined form the principal and most important industry in Switzerland. They employ in normal times about 45,000 hands, with 15,000 looms, and deal with over 2,000,000 kilogrammes of silk imported from France, Italy, and Japan. Almost the whole of the produce of the Swiss silk industry is exported. Approximately 70 per cent of the silk goods manufactured at Zurich were formerly exported to the United Kingdom. There are no statistics available regarding the exact amount of silk stocks held, but they are stated to run up to from £5,000,000 to £6,000,000 at the present moment. Mills have been obliged to reduce their output, and the number of looms actually running is stated to be only about 75 per cent. of the number working in normal times, and it is anticipated that there will soon have to be a further reduction to 50 per cent.

A general accumulation of raw material has resulted from the reduced exports. It is estimated that on 30th June, 1918, there were stocks of silk thread in Switzerland amounting to 250,000 kilogrammes. At the end of last December this figure is stated to have increased to 775,000 kilogrammes. The alleviation in the restrictions which took effect on the 1st March, 1919, permitting silk imports into England to the extent of 50 per cent of the value in francs imported in 1916 does not appear to have given the general satisfaction which was anticipated.

With regard to the Basle silk ribbon industry, the relaxation in the restrictions has come as a great relief to the industry. In 1913 the Basle industry produced 7,000 cwt. of silk ribbon valued at 42,063,000 francs, of which over half (4,098 cwt.), valued at 23,930,000 francs, were exported to the United Kingdom. In 1916 these exports rose to 10,000 cwt. valued at 73,114,000 francs, of which 7,226 cwt., valued at 48,632,000 francs were exported to Great Britain.

Switzerland's share in the imports of silk goods into the United Kingdom has been comparatively small during the latter part of the war. During the first eleven months of 1918 Great Britain imported

from all sources 86,800,000 yards of silk goods, to the value of £12,500,000, as against 65,700,000 yards, to the value of £7,700,000, during the same period of 1917. Switzerland's share in these imports decreased from 6,800,000 yards in 1917 to 3,400,000 yards in 1918. At the same time the Swiss point out that the imports of silks into the United Kingdom from Japan and Italy, and of silk mixtures from France have greatly increased.

The Swiss have been compelled to reduce their output, and some mills have been forced to work short hours or even close down. The Swiss Government has recognised the seriousness of the crisis; in cases where the mills have to be closed down the workmen receive two-thirds of their wages, half of which amount is paid by the mill owner and half by the Federal Government.

SANITATION AND PUBLIC HEALTH.

Influenza.

The following *Memorandum Notification No. G. 50 (one)—Med. 56-18-112, dated 8th July, 1919*, on Influenza has been issued by the Government of India for general information:—

During 1918 a peculiar and exceptionally widespread epidemic of Influenza appeared, which affected the inhabitants of practically every continent. This epidemic not only caused directly or indirectly, a very large number of deaths which in India alone were computed to exceed five million, but left behind it a legacy of minor ailments with consequent national debility. The economic effect through the disorganization of trade cannot be estimated but must have been very great.

Although previously severe and world wide epidemics have been known to occur, in none were the spread and mortality so alarming as in the epidemic of 1918. So far as it affected India, the epidemic of the summer months assumed a mild form of the disease. After an apparent departure, it re-appeared in a virulent and very fatal form during the autumn months and then seemingly disappeared at the end of the year. In fact this was not so, as small localized epidemics have occurred and sporadic cases have continued throughout the present year. As the experience of epidemics in England and elsewhere has been that recrudescences at intervals are liable to occur, it is highly desirable to be prepared for such an event in India.

With this object in view, this Memorandum has been prepared, which sets forth opinions founded

upon the valuable observations made during the 1918 pandemic and contained in the world's medical literature and which furnishes in the abstract a list of the preventive measures that promise to give the best results in India. It is not possible to say that even with the adoption of the suggested measures it will be possible to prevent the disease becoming epidemic, but it can safely be asserted that the observance of these rules will diminish the incidence of the infection.

The organism responsible for the epidemic of influenza has not been definitely identified. The weight of evidence still points, however, to the bacillus, called the bacillus of Pfeiffer being the cause: at all events it is intimately associated with the disease. Judging from clinical and epidemiological standpoints, the disease which appeared in India was identical with the last great pandemic of influenza which occurred in 1890-91. In the absence, however, of definite proof of the casual organism, this statement is a surmise although a probable one.

Influenza is a disease which exhibits an intense infectivity and an incubation period which is relatively very short, *i.e.*, from 6 to 48 hours. It is commonly believed that the disease is spread by the infected secretions of the throat and nose of infected persons finding lodgment in the nose and throat of uninfected people. The commonest means by which this occurs is by coughing and sneezing, especially in confined spaces. Methods of prevention, then, will consist of preventing communication of infection by these channels.

These measures may be considered from two standpoints.

I.—Procedure recommended for Military, Municipal, and other Administrative Bodies.

It is realized that no legislative measures can be adopted in most communities and moreover since the limitation of an epidemic of this nature depends more upon individual than upon legal enactments, the following general recommendations are made.

A. Education of the public with regard to such facts as the following:—

- (1) The golden rule is to keep fit and avoid infection as much as possible.
- (2) The way to keep fit is to cultivate healthy and regular habits, take regular exercise, to eat good food, and to avoid fatigue, chill and alcoholism. Healthy living does not of itself ensure against attack, but it makes the patient better able to withstand the complications which may kill.
- (3) The earliest symptoms of influenza are usually those of a severe feverish cold: it is most infectious in the earliest stages; it is

spread by discharges from the mouth and nose; it kills mainly by its complications and every person suffering from the disease, no matter of how mild a form, is a danger to others. For these reasons coughing, sneezing, spitting and hawking in public places are dangerous.

- (4) It is not always possible to avoid infection, but the risks can be lessened by—
 - (a) healthy living ;
 - (b) working and sleeping in well-ventilated rooms ;
 - (c) avoiding crowded gatherings and close ill-ventilated buildings, or carriages ;
 - (d) wearing warm clothing ;
 - (e) irrigating the nose with saline solution (see later) ;
 - (f) wearing in certain instances a mask of prescribed pattern (see later)
- (5) Do not lay too much emphasis upon drugs in the hope of preventing infection
- (6) Those attacked should
 - (a) go to hospital or go home, go to bed and keep warm ;
 - (b) call in a doctor, where possible ;
 - (c) occupy, if possible, a separate bedroom or a bed that is screened off from the rest of the room ;
 - (d) when coughing or sneezing hold a handkerchief in front of the mouth, the handkerchief should be boiled or sterilized in antiseptics, or burnt if of paper. Similar attention should be paid to linen, etc., soiled by discharges, by persons suffering from common cold or catarrh, as it is undoubted that in apparently healthy communities the infective agents of influenza are frequently present in such persons,
 - (e) Do not return to work, through a scene of duty, until convalescence is well established, and during convalescence be extremely careful to avoid chill which may induce a relapse or complications ;
 - (f) avoid meetings and places of entertainment for at least one week after the temperature has become normal.

Such education we believe should be made compulsory in all schools and colleges; the press might and by giving publicity to such measures as are recommended for adoption.

B. The closing of meeting places, schools, colleges, cinema halls, dancing halls, skating rings, churches, etc.—Regarding these measures universal

recommendations cannot be made. The widespread depression in the minds of the general population during epidemic times must be remembered. Such depression may be a predisposing factor in the occurrence of the disease, and it is felt that if measures were passed such as closing all theatres and resorts of amusement, the effect on the public health might be worse than if nothing was done at all.

Again, take the instance of schools; if children were taken from well ventilated schools they might add to the congestion of already overcrowded houses. This matter must be left to individual localities to settle, bearing in mind that it is necessary to limit the number of unnecessary gatherings and that it is necessary to keep up the moral of the public. In this connection attention should be drawn to the dangers associated with travelling in cars and carriages. It is believed that a fertile source of the spread of infection occurs in overcrowded railway carriages, tram cars, etc. The prevention of overcrowding should especially be insisted on at such times and scrupulous cleanliness of carriages and cars be enforced. It is believed that much mischief was done in the last epidemic by the exodus from cities of panic-stricken populations, and facilities for such exodus should be prohibited.

C. The wearing of face masks.—Opinions are divided as to the efficacy of this measure: it largely depends upon their construction. The masks should be of very close woven muslin or gauze. Recent work in America would seem to point to a gauze with a mesh 44 by 40 to the inch: three to six layers of fine muslin should form the mask and they should be applied so as to cover the nose and mouth completely. The gauze is cut 8 inches wide and 23 inches long. Details of the method of manufacture are given in a foot-note.*

The use of these masks should be made compulsory among nurses and attendants in hospitals which admit influenza patients and might be adopted in houses where cases of influenza are present and among volunteers and others who come in contact with the

*The gauze 44 by 40 mesh is cut 8 inches wide and 23 inches long. The sides and one end are turned down one quarter inch. It is folded twice, the unturned end first, making a $7\frac{1}{2}$ inch square. The opposite diagonal corners are cut off 1 inch and the raw edge is turned in one-half inch. It is stitched firmly all around. A 1 inch dart $1\frac{1}{2}$ inches long is taken up at the middle of each side of the mask. A 14 inch tape is sewed on the opposite uncut corners. This mask has the advantage of covering the nose and mouth and in making the traction on the chin and now drawing on the nose and lips.

sick. The wearing of a face mask, whilst having a certain protective action, exerts an educative influence upon the patients. Though it would be more reasonable for the patients to wear a mask, this is impracticable in view of further impending respiration which already may be difficult.

As there is a small possibility that droplets of infective matter lodging in the eyes may give rise to the disease, the use of goggles by such attendants may also be recommended.

Another suggested use of face masks is by barbers, dentists, etc., whose occupation brings them into close contact with a number of persons, and who if incubating the disease may otherwise infect their clients.

D. Isolation.—It is feared that insistence upon isolation of influenza cases in India is impossible. For one thing there is not sufficient hospital accommodation. Every case, however, of influenza, pneumonia should be rigorously isolated as the germs present in post-influenza pneumonia are themselves infectious, altogether apart from the causative organisms of influenza. Hospitals should attempt to separate uncomplicated influenzal cases from those suffering from secondary pneumonia.

B. Sprays and Gargles.—The use of disinfectant sprays and gargles is not recommended. Disinfectants are apt to remove the protective mucus of the throat and mouth; to cause irritation of the mucus membranes or lining membranes of these cavities and so predispose to the lodgment of infective material. They can hardly be used strong enough to be protective without causing violent irritation.

The use, however, of a solution of common salt one teaspoonful to a pint of 20 ozs. might be productive of good results if used as a gargle or sniffed up the nose, as it will produce an excess of the normal secretions of the nose and throat and this leads to the washing-out of micro-organisms.

F. Disinfection.—With regard to the disinfection of infected rooms, it seems fairly established that ordinary cleansing with water, airing, and sunning effect as much good as the use of actual disinfectants. In addition, as already suggested, all handkerchiefs, sheets and clothings recently soiled (within 48 hours, as drying kills the infective agent) should be boiled or otherwise sterilized.

The periodic disinfection on the above lines of public places, e.g., railway waiting rooms, trams, rolling stock, dak bungalows, serais, etc., which in epidemic times may be taken to be infected, is also strongly recommended.

G. Quarantine.—A limited measure might be practised by local institutions such as resident colleges, schools, asylums and jails. A jail, for example,

situated in an epidemic area, might be rigidly quarantined or reasonably certain of keeping out infection or at least of delaying its appearance. There was evidence of the efficiency of this measure in certain jails in India during the last epidemic.

H. Notification.—Notification of all cases of influenza would be obviously impossible. A limited notification might, however, be adopted at ports; some value being likely to result from the notification of infected ships and the prompt removal to hospital of actual cases.

Notification of influenzal pneumonial is now compulsory in England and in Australia. This measure in India would only be possible amongst the military and in civil in large towns where the Municipal Acts already permit of the notification of all forms of infectious disease.

II. PROPHYLACTIC VACCINATION.

A mixed vaccine has been prepared and will be available in India in moderate quantities. Until its efficacy or its non-efficacy is established, we can offer no authoritative statement as to the advisability of general prophylactic inoculation.

III. MEASURES FOR ORGANIZED RELIEF.

(a) Local authorities should have ready lists of their requirements for doctors, nurses, the additional hospital staff required, such as sweepers, bhitis, etc. mask makers, motor cars, ambulance drivers and volunteers of all kinds necessary for the actual treatment of the sick; and have noted, as far as possible, the actual persons who could prove useful in various accessory capacities. A canvass of private cars which people are willing to lend as ambulances, might advantageously be made. Further, the names of volunteers, for district visiting and localization of cases should be noted.

In this connection too it would be well for municipalities and other local authorities to entrust the actual arrangements prior to an epidemic and preparatory for it, to some already organized body such as the St. John's Ambulance Brigade Nursing Association, as in addition to the above, hospital requisites must be obtained, e.g., beds, mattresses, etc. Lists of what are available should be made ready.

(b) Resources of men and material should be centralized under one central authority.

(c) The work of District visitors in a house-to-house canvass, referred to under paragraph (a) above, should be co-ordinated. Valuable information would thus accrue as to the actual extent of the disease. These visitors should also be instructed as to the type of case and home which would justify home treatment being adopted, and when hospital treatment is necessary.

A central clearing house or a bed dispensary might be instituted in large towns and severe cases be transferred from these to the hospitals. Hospitals should be warned to admit only severe cases as their resources will be taxed to the uttermost.

(d) It is needless to say that all other public health organizations, such as vaccination and plague organization staff, etc., should be utilized for the various measures of influenza epidemic control.

THE INFLUENZA EPIDEMIC.

How to Douch.

The following press communique has been issued by the Education Department:—

The method and value of nasal douching as a preventive of influenza.—The sanitary commissioner with the Government of India recommends the douching of the nasal cavities and throat as a preventive of influenza. The following description of the method of douching is published for general information:—

(a) Dissolve one teaspoonful of salt in a pint of warm water.

(b) Gargle the throat with some of the solution.

(c) Place the remainder of the solution in a basin.

(d) Immerse the nostrils in the solution.

(e) Sniff slowly some of the solution up the nostrils until it is felt at the back of the throat.

(f) Raise the head from the basin and allow the solution to flow from the nostrils into a bucket.

(g) Repeat this process two or three times.

The whole ritual should be carried out four or five times daily. The above procedure has been reported to have given very good results during the last epidemic in South Africa. For instance, out of 91 persons, mostly nurses, who were especially exposed to infection, only three developed light attacks.

STATISTICS. Cotton Seed Oil, &c.

The following statement, compiled in the Department of Statistics, India, shows the quantity and value of cotton seed oil, groundnut oil and oilcakes (Indian Merchandise) exported by sea from British India to foreign countries during the month of March, 1919:—

		March 1919.	
		Quantity	Value
		Gallons	Rs.
Oils—			
1 Cotton seed	...	Nil	Nil
2 Groundnut	...		
To countries other than United Kingdom		5,177	13,711
Share of Madras		3,890	9,690
,, Burma		1,200	3,601
Oilcakes—			
1 Castor cake—		cwts.	
All to Ceylon		5,526	30,229
2 Cotton cake—			
All to United Kingdom		16,964	75,357
3 Groundnut cake—			
To United Kingdom		53,658	190,862
To Ceylon		77,005	392,341
To other countries		34,349	1,36,670
Total		165,012	7,19,873
4 Linseed cake—			
All to United Kingdom		13,800	55,012
5 Rape and Sesamum cake			
To United Kingdom		1,578	6,874
To Ceylon		31,251	2,57,418
To Japan		...	...
Other countries		140	588
Total		32,969	2,64,880
6 Others	...	10,380	42,535

Statistics of the export trade of Yatung (Tibet) for the past two years are given below ;—

	1918-19.	1917-18.
	Rs.	Rs.
Merchandise ...	27,25,721	21,05,435
Treasure ...	3,45,880	2,68,958
Total ...	30,71,601	23,74,393

The export of merchandise last year consisted of raw wool, ponies, mules, sheep, yak-tails and musk. The largest article of export was raw wool weighing 79,179 maunds to the value of Rs. 2,175,114 as compared with 76,816 maunds to the value of Rs. 18,44,967 for the year 1917-18. The value of imports was as follows :—

	1918-19.	1917-18.
	Rs.	Rs.
Merchandise ...	14,38,874	11,86,448
Treasure ...	40,420	5,000
Total ...	14,79,294	11,91,448

The import of merchandise consisted of cotton and woollen piece-goods, precious stones, tobacco, silk and metals. The largest item of import was cotton piece-goods, of foreign manufacture weighing 701 maunds to the value of Rs. 137,143 as compared with Rs. 164,273 for the year 1917-18. Next come cotton piece-goods of Indian manufacture weighing 1,981 maunds valued at Rs. 2,28,781 as compared with Rs. 1,04,242 for the year 1917-18. It will be noticed that there is an increase of Rs. 6,97,208 in the export trade and an increase of Rs. 2,87,846 in the import trade as compared with the figures of the previous year. The Tibetan traders of the Chumbi Valley are still flourishing with the carrying trade between Phari and Kalimpong. The number of traders in the Yatung Bazaar is very limited.

The Dominion Bureau of Statistics has completed its census of the manufactures of Canada for the year 1917, and the preliminary totals are now available, says the *Board of Trade Journal*. The returns cover 34,380 establishments and show a remarkable development in this branch of Canadian industry when compared with the census of 1915, as summarised in the following table :—

		1917 Dols.	1915 Dols.	Increase Dols.
Capital invested ...	...	2,772,517,680	1,994,103,272	778,414,408
		No.	No.	No.
Employees on salaries ...	...	73,598	52,683	20,915
		Dols.	Dols.	Dols.
Salaries paid ...	...	95,983,506	60,308,293	35,675,213
		No.	No.	No.
Employees on wages (including piece-workers) ...	...	619,473	462,200	157,273
		Dols.	Dols.	Dols.
Wages paid ...	...	457,245,456	229,456,210	227,789,246
Cost of materials ...	...	1,602,820,631	802,133,862	800,686,769
Value of products ...	...	3,015,506,869	1,407,137,840	1,608,369,729

The Gross value of goods made in Canada in 1917, amounted to 3,015,506,869 dols., and the cost of materials was 1,602,820,631, leaving a net value added by the process of manufacture of 1,412,686,238 dols., or 5,549,098 dols more than the gross value of production in 1915. The twenty leading industries with the gross and net values of their production are given below in order of precedence :—

	Gross value Dols.	Net value Dols.
Flour and grist mill products	224,191,735	40,604,399
Steel furnaces and rolling mills	170,679,000	62,040,044
Slaughtering and meat packing	153,279,252	36,082,497
Long products	115,884,905	75,159,877
Munitions	112,866,838	70,240,235
Pulp and paper	96,340,324	61,627,462
Butter and cheese	85,734,339	13,719,662
Cars and car works	78,564,527	39,884,077
Bread, biscuits and confectionery	77,223,581	33,022,111
Sugar, refined	73,329,260	20,149,349
Smelting	69,262,673	33,591,253
Foundry and machine shop products	66,945,483	43,322,382
Iron and steel products	58,797,766	26,777,534
Building and contracting	54,668,255	32,927,335
Automobile	54,466,273	18,880,4 ⁵ 3
Slaughtering, not including meat packing	53,441,466	14,771,901
Boot and Shoes	49,170,062	22,389,519
Electric light and power	44,536,848	44,536,848
Leather, tanned, curried and finished	41,117,128	14,492,651
Electric apparatus supplies	40,204,245	20,046,238

The totals of the twenty leading industries in gross and net value of production were 1,720,700,960 dols., and 724,266,227 dols., and they represent respectively 57 per cent and 51 per cent of the grand totals for the Dominion.

The *Board of Trade Journal* says :—Statistics of the production of the most important metallic and non-metallic minerals of Japan proper, issued by the Japanese Bureau of Mines, are as under (in long tons) :—

Minerals	1917 Tons.	January- June. 1918. Tons.
<i>Metals.</i>		
Antimony—		
Refined	6,562	(a)
Crude	10	(a)
Chromic iron ore	8,798	1,173
Copper	63,812	41,787
Gold—		
Lode	(b) 226,122	(b) 122,632
Placer	(b) 1,402	(a)
Lead	15,557	2,419
Manganese ore	50,552	12,319
Molybdenum	12	(a)
Platinum, placer	(b) 132	(a)
Quicksilver	2	1
Silver	(b) 7,111,720	(b) 3,166,344
Tin	209	87
Tungsten	721	291
Zinc (metal)	53,852	(a)
<i>Non-Metals.</i>		
Asphalt	3,811	1,414
Coal—		
Bituminous	25,939,637	13,999,517
Lignite	150,400	76,023
Graphite	1,308	538
Petroleum crude	(c) 2,850,159	(c) 1,220,968
Phosphate rock	119,682	112,519
Pyrites, iron	119,426	(a)
Sulphur	116,120	34,963

(a) Figures unobtainable.

(b) Troy ounces.

(c) Barrels of 42 gallons.

MYSORE ECONOMIC CONFERENCE.

Progress in the Districts.

Chitaldrug.

AGRICULTURE.

Ploughing Demonstrations.—Ploughing demonstrations were held in four villages and Jaggery boiling demonstrations, in three places.

Verity Ploughs.—Seven Verity ploughs were introduced.

Formation of a Nursery.—A small nursery of poppy seedlings was formed in Chitaldrug for free distribution to the growers.

EDUCATION.

A Reading Room.—A reading room was started at Nulenur in Holalkere Taluk.

INDUSTRIES AND COMMERCE.

A Shoe Factory.—The question of starting a Shoe Factory at Chitaldrug by Mrs. Arbuthnott was discussed and a loan of Rs. 500 was resolved to be granted on proper security and also help her with a loan of a sole stitching machine and up-to-date tools.

Shimoga.

Agriculture.

Cattle Show at Shimoga.—In connection with the holding of a Cattle Show at Shimoga the Committee resolved to hold it on *Phalguna Suddha Bidige* every year.

EDUCATION.

A Panchama School.—A Panchama School was started at Tyajavalli.

A Grant-in-aid School.—A grant-in-aid school was started at Korlahalli village and a contribution of Rs. 48 was collected towards the pay of the teacher.

A Reading Room.—A reading room was started at Balekoppa.

INDUSTRIES AND COMMERCE.

A Furniture Factory.—In connection with the subject of starting an up-to-date Furniture Factory at Shimoga, the Committee thought it very necessary that a further attempt should be made in view of the many facilities available in Shimoga for starting such a factory.

BOOKS IN BRIEF.

Hand-book of Plantation, Fibre and Fruit and Industry.—By J. K. Sircar, Calcutta.

This is a little book giving much useful information on the plantain fibre and fruit industries. The uses of the plantain fibre, methods of extraction, machinery required, with lists of machine makers and marketing of fibre are a few of the matters dealt under the head of "fibre." As regards the "fruit," its conversion into plantain meal is given, with chemical analyses of some by various chemists. The preparation of the meal on a commercial scale also receives attention. Altogether the book is a thoroughly practical one and being translated, ought to prove useful to those interested in the plantain fibre and fruit industries in India.

Hints to Farm Pupils.—By E. W. Lloyd, late Lieutenant T. P. Res., London—John Murray. 2s. 6d.

This is a capital little book for those starting to learn farming. Lient. Lloyd writes as a practical farmer and what he says is out of the abundance of his own experience. The book ought to appeal to a wide class of people now found taking increasing interest in farming in this State. It is books of this kind that those intending to take advantage of the Large Landed Estates Scheme should study for picking the "hints" they want.

School and Home Gardening.—By K. C. Davis, Ph.D., Knapp School of Country Life Philadelphia and London, J. P. Lippincott Company. 4s. 6d.

This is just the sort of publication we have long been looking for, for the use of young people. The authoress has understood aright, in our opinion, the objects and aims—nay the spirit—of the school garden movement and has provided in her book useful hints and practical instruction for both students and teachers alike. Leaders in the garden work movement would also do well to study the book, especially the first two chapters. We have no doubt that teachers in this country will find the volume a most helpful one. The illustrations, which number 160 in all, enhance the value of the publication. We shall be glad if the book has the attention it deserves in this country.

RECENT PUBLICATIONS.

Vegetable Gardening.—By J. S. Chisholm, Senior Lecturer in Horticulture, Edinburgh and East of Scotland College of Agriculture. (The People's Books Series.) $6\frac{1}{2} \times 4\frac{1}{4}$, 126 pp. Nelson. 1s. 3d. n.

Our National Forests.—A short popular account of the work of the United States Forest Service on the National Forests. By Richard H. Donai Boerker, Arboriculturist Department of Parks, City of New York. $8 \times 5\frac{1}{2}$, lxix. + 238 pp. Macmillan Co. 12s. 6d. n.

Manual of Tree Disease.—By W. Howard Rankin, Assistant Professor of Plant Pathology, New York State College of Agriculture, at Cornell University. $7\frac{1}{2} \times 5\frac{1}{4}$, xx + 398 pp. Macmillan Co. 12s. 6d. n.

The Kitchen Garden and its Management.—Abridged and adapted from the Standard French Work of Professor Gressent. By David Garnett. $5\frac{1}{2} \times 4\frac{1}{4}$, 90 pp. Selwyn and Blount. 1s. n.

Practical Potato Cultivation.—By E. H. C. 7×5 , 12 pp. Drane's 3d.

Co-operation in India.—By Henry W. Wolff. $8\frac{1}{2} \times 5\frac{1}{2}$ vii. + 352 pp. Thacker. 12s. n.

The Forgotten Man, and other Essays. By William Graham Sumner. Edited by Albert Galloway Keller. $9 \times 6\frac{1}{4}$, 559 pp. New Haven. Yale University Press. London. Milford. 10s. 6d.

The Coal Industry.—Dangers of Nationalization. By Harold Cox. (Third Impression.) $8\frac{1}{2} \times 5\frac{1}{2}$, 18 pp. Longmans. 6d.

Labour—Capital—Brains.—By M. L. Tyler. $8\frac{1}{2} \times 5\frac{1}{2}$, 16 pp. St. Catherine Press. 2d. n.

Militarism in Education.—A contribution to educational re-construction. By John Langdon—Davis. $7\frac{1}{2} \times 5$, 154 pp. Headley. 3s. 6d. n.

Simple Beginnings in the Training of Mentally Defective Children.—By Margaret Macdowall. $7\frac{1}{2} \times 5$, viii. + 116 pp. Local Government Press Co. 3s. 6d. n.

The Irish Labour Movement.—From the Twenties to our own day. By W. P. Ryan. $7\frac{1}{2} \times 5$, 266 pp. Dublin: Talbot Press. London: Fisher Unwin. 4s. 6d. n.

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MEMORANDUM ON EDUCATION IN MYSORE.

BY THE EDITOR.

ABOUT the middle of last month, the Government of Mysore issued an important Memorandum on Education in the State. It deals fully with a Report submitted to Government by the Inspector-General of Education, and suggests lines of action in regard to various points of policy and organization raised by him. The main object of the Memorandum is the formulation of policy in regard to education generally. With this object, the Memorandum has been issued for public discussion.

Among the subjects discussed in the Memorandum are the following :—

Primary education and the right mode of developing it; Secondary education and the changes required in regard to it; reorganization of Technical instruction; Women's education and the need for remodelling it; Mahomedan education and the best ways of improving it; Education of backward classes; Panchama education; training of teachers; reorganization of the inspectorate; educational buildings; and matters relating to religious instruction, medical inspection of pupils, adult education, extension of the library organization, institution of a provident fund for teachers, etc.

The proposals embodied in the Memorandum are of a tentative character, being

mainly intended to elicit public opinion on them. Three months time is given to educational associations, aided agencies and the general public for formulating their definite suggestions on the same for the consideration of Government.

The following is an official summary of the Memorandum, which we print as issued to the public :—

The policy of vigorous expansion of Education in all grades inaugurated in 1913 has resulted in considerable development in all directions and has doubled the expenditure on Education in the last quinquennium. The Departmental Organization has been neither expanded nor improved in proportion to the rapidity and magnitude of these developments with the result that it is becoming increasingly inefficient and unequal to the task. In order to derive benefits commensurate with the number and variety of educational institutions and the amount of expenditure incurred it is necessary to review the lines of development in the past, take stock of the progress attained and lay down a policy for the future. A Memorandum on the subject was promised by the Dewan at the last Session of the Representative Assembly to focus public attention and awaken their interest in these problems and invite their co-operation in finding satisfactory solutions for them. The Memorandum deals with the present condition of Education in the various grades giving a brief historical retrospect and suggests tentatively the various measures to be adopted for the

improvement of Education in the State in order to consolidate the results already achieved, to secure greater correlation between the various grades of Education in courses and curricula and place future expansion on a firm and solid basis.

The half salary grant-in-aid schools introduced in 1914 to which class nine-tenths of the Primary Schools in the State belong have some very grave defects, *viz.*, inefficiency, uncertainty of continued existence due to the poor emoluments paid to the teachers and the unwillingness of the villagers to pay contribution, want of equipment in the schools, and inadequacy of the teaching and inspecting staff. The proposals in the memorandum lay special stress on the improvement of Primary Schools. They are briefly:—

- (i) The conversion of all aided Primary Schools into Government institutions with a view to establish 10,000 Primary Schools in the State so as to have one Primary School for every unit of population of 600 persons in the State and every unit area of 2'9 sq. miles.
- (ii) Improvement of the efficiency of these schools by developing all the Primary Schools to the highest, Primary standard, namely, the III Vernacular Standard or the fourth-year course in the Vernacular, by providing them with a number of teachers proportionate to the number of pupils in the ratio of one teacher to every thirty pupils.
- (iii) By granting a minimum scale of equipment for every Primary School and by the provision of trained teachers.
- (iv) By distributing the schools entirely on the basis of population.
- (v) By providing an adequate scale of Inspectorate at the rate of one Assistant Inspector, a trained

graduate on Rs. 75 - 10 - 125 for every 100 Primary Schools.

- (vi) By revision of curricula with a view to introduce systematic instruction in Kindergarten methods and nature study.

The scheme of compulsory education is at present introduced entirely at the cost of the State Revenues without any financial co-operation from local bodies. On the one hand this leads to unequal development of education in urban and rural areas and on the other hand further extension involves considerable expenditure to the State. In the Memorandum it is therefore proposed to afford equal encouragement to education in urban and rural areas by transferring control of primary education to local bodies and limiting the Government contribution for primary education in each local area according to a provincial scale based upon population, namely, two-thirds of the recurring charges on establishment and one-half of the non-recurring expenditure on buildings and equipment. To meet the large additional expenditure involved in adopting the above policy it is proposed to augment the resources of local bodies by making over to them a fraction of the local cesses on the land revenue and excise which are not now given to them and they will be further empowered to raise local cesses for educational purposes. The Government share of the expenditure will be met partly by enhancing the present allotments on Primary Education by the proposed income-tax as requested by the Representative Assembly.

At present the Middle Schools in rural areas are purely vernacular Middle Schools, Anglo-Vernacular Middle Schools being mostly located in urban areas. It has, therefore, been considered necessary to remove this disability and to create facilities for the higher education of the rural classes. The chief reforms proposed for Middle Schools are the introduction of one uniform type of

Middle Schools for rural and urban areas with vernacular as the medium of instruction and English as a second language, the increase of the number of Anglo-Vernacular Schools to 600, the introduction of practical instruction and elementary science into the curriculum, the revision of the Anglo-Vernacular course to one of four years, the provision of Government Hostels on the self-supporting basis, of private hostels on the grant-in-aid basis and the abolition of fees in Middle Schools if practicable.

The long-needed reforms in High School education are the improvements of science teaching, the introduction of the Polytechnic types of schools and of a better system of acquisition of knowledge and of training of the mental faculty by the adoption of the vernacular as the medium of instruction in a larger number of subjects. It is proposed in the memorandum to improve the accommodation for science teaching by the construction of Science Halls, to improve efficiency of teaching by the recruitment of more qualified staff and to improve the equipment of the laboratories. It is also under contemplation to raise the standard of instruction in science in the High School classes by the introduction of elementary science in the Middle School course so to prepare the pupils for a higher standard of instruction in science.

To give a practical bent to education and at the same time afford industrial and technical training to the pupils it is proposed to remodel the scheme of studies in the High School courses so as to correlate it to a well-ordered scheme of technical instruction combined with literary education. The practical instruction according to nature study and kindergarten methods in the primary classes will be followed by elementary agricultural and industrial training in the Middle School course to be followed in its turn by the comparatively advanced industrial and agricultural training in the High School classes. The

scheme of studies in the Agricultural School, Commercial School, Mechanical Engineering School and the Chamarajendra Technical Institute will be adjusted so as to provide in these institutions opportunities for further practical training to the students of the High Schools who discontinue their literary studies after the High School course.

As regards the controversial question of medium of instruction in High Schools the arguments that should be considered in connection with the question have been focussed together in the memorandum. No solution is suggested for the present but it is pointed out that the difficulty in introducing the reform due to diversity of languages does not exist in Mysore.

The re-organization of Technical Instruction in Mysore has been taken up for detailed consideration. The causes of the failure of the existing industrial schools in improving the several industries have been traced to the low scale of expenditure, the want of competent teachers, the inadequacy of the equipment and to the low standard of general education of the pupils that resort to the industrial schools. The reforms suggested in the memorandum are therefore the gradation of industrial courses into elementary and higher in the Taluk and District Industrial Schools respectively, the drawing up of syllabuses suited to each grade, the introduction of art instruction in the Industrial Courses, the provision of Central Training Classes for teachers of industrial schools, the provision of a liberal scale of equipment, revision of the scholarship-rules, the opening of Trades Schools for manual industries, the training of pupils in business methods, the organization of the Home Industries Classes, and the correlation of the scheme of training in Industrial Schools to the industrial and technical training imparted in the Middle School and High School Courses.

In the case of Women's education the causes that retard progress have been

analysed and the measures necessary to extend it considered. It is proposed to treble the number of primary schools for girls and to afford greater encouragement to their higher education. Women's education is proposed to be remodelled so as to impart to a pupil before the age of withdrawal from schools the maximum amount of education possible without encumbering the advanced studies of the small minority who proceed to the University Courses. The introduction of subjects which are of immediate use to the girls in the position in which they have to occupy in the household in later life has also been proposed. Special efforts are being made to staff girls' schools with qualified women-teachers. A separate Inspectorate for girls' schools has been organized. A scheme of scholarships for the Secondary Education of Girls has been sanctioned. To provide qualified assistant mistresses and women teachers of primary schools a scheme of opening Normal Schools for women teachers has been proposed. The question of making vernacular the medium of instruction has been discussed as being of more immediate importance to the education of girls in view of the special customs requiring their early withdrawal from schools.

The education of Mahomedans requires immediate attention being given to the improvement of the efficiency of schools by the appointment of more qualified staff, better accommodation and special means of encouragement. Though the number of schools is adequate to the population yet all the defects pointed out above in dealing with the grant-in-aid policy are intensified in the case of Hindustani Schools. The courses and curricula require improvement. Special arrangements are necessary for the training of teachers. The memorandum suggests for consideration whether the avowed disadvantages of the system of schools exclusively for Mahomedans may not be removed by their amalgamation with the Anglo-Vernacular Schools with special arrangements for

teaching Urdu. This would release large resources for giving scholarships to pupils of that community. This reform is in fact suggested by the preference shewn by enlightened members of the community to the Anglo-Vernacular Schools. The education of Mahomedan girls is attended with special difficulties peculiar to the Ghosha system. The only remedy within the range of practical politics is to provide the Hindi Girls' Schools with qualified mistresses and pay special attention to and afford special facilities for the training of the mistresses.

The memorandum proposes the continuance of the liberal scheme of backward classes scholarships instituted for all grades of education. The abolition of fees in Middle Schools which is under consideration will also have the effect of releasing larger resources for scholarships for the higher education of these classes.

The proposals made in the memorandum regarding Panchama education relate to the increase of the number of Primary Schools, utilisation of the Central Boarding Schools as institutions for training teachers for the primary schools in a larger measure than at present, the continuance of the liberal scale of scholarships and other inducements and allotment of special funds for further expansion. The combination of industrial training with literary education advocated in another portion of the memorandum has been already effected in the case of Panchama Schools.

One grave defect of the scheme of increasing the grant-in-aid schools by leaps and bounds, namely, the inefficiency of the staff was aggravated by the utterly inadequate arrangements made for the training of teachers of Primary Schools. A scheme of opening eighty training classes for such teachers has been proposed in order to train teachers adequate to the number of aided schools taken over under Government management. A training in the Normal School is, however, prescribed for Head-masters of

Primary Schools and Assistant Masters of Middle Schools.

To improve the efficiency of the Inspectorate it is proposed to appoint an Assistant Inspector on Rs. 75—10—125 for every 100 Primary Schools, to increase the pay and prospects of the District Inspectors and abolish the Circle Inspectors of Education their functions being delegated to an Assistant to the Inspector-General of Education of the rank and status of a Circle Inspector. It is also proposed to improve the pay and prospects, the qualifications and efficiency of the entire educational service and make appointments in the tutorial line interchangeable with those of the same grade in the Inspectorate to prevent either set of Officers falling into a groove and the narrowing of their outlook.

As regards educational buildings the memorandum explains the policy recently inaugurated by Government of revising the type-designs to make them cheaper, to have a programme of building construction prepared in advance, to set apart a sum of Rs 3½ lakhs per annum for the purpose to be worked out as far as possible on the grant-in-aid basis and to encourage private effort to provide buildings on a guarantee of long leases. The policy of making grants to local bodies responsible for Primary Education for the construction of buildings has been advocated in view of the proposed transfer of control of elementary education to them.

Among other matters dealt with in the memorandum are the improvement of the scheme of adult education, of direct religious and moral instruction, of the Medical inspection and physical culture of pupils, the extension of the library organization in the State, the institution of a Provident Fund for aided institutions and the publication of text-books in Kannada on subjects of modern knowledge.

The memorandum has dealt with the cardinal problems relating to the improvement of

the existing educational organization and the future expansion and development of education on sound lines. The forecast works out to a recurring expenditure of Rs. 68 lakhs per annum, an increase of one hundred per cent on the total expenditure in the current year. The task is a stupendous one and the increase of expenditure in proportion enormous. Ways and means have been suggested for meeting nearly half the proposed increase and it is hoped that the other half could be found without unduly straining the resources of the State. The proposals made above are tentative and are subject to revision in the light of criticisms and suggestions received. The final shape and actual working out will depend to a considerable extent on the ability of the local bodies to undertake the responsibilities proposed in the memorandum.

The United States Geological Survey, in its latest Reports, gives the total gross weight of all grades of Chrome ore produced and shipped in the United States in 1918, as 79,000 long tons, equivalent to 63,000 long tons of ore of 50 per cent grade. There were about 700 owners of domestic Chrome deposits in 1918, of which only about 270 actually shipped and marketed their output.

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The Norwegian Paper Mills have stopped working, wholly or partially, chiefly on account of the new restrictions on paper imports into England. Hardly any mills have orders in hand. It is said that the English restrictions will be withdrawn in six or eight months' time, but long before then all the Norwegian paper industries will have to close down.

PROGRESS OF AGRICULTURE IN MYSORE.

BY H. V. KRISHNAYYA, B.A.,

*Officiating Director of Agriculture
in Mysore.*

IN common with the rest of India, Mysore is so largely agricultural, that the question of the improvement of agriculture in the State cannot but be a subject of predominant and perennial interest. It may perhaps be useful if an attempt is made to take stock of what has been done so far and to suggest what may be done during the next few years in furtherance of this object.

The question of creating a separate department which should solely concern itself with agricultural improvement has long been engaging the attention of the Government of India. It would come prominently into notice in times of famine and recede into the background when the stress was relieved; but no practical action was taken until 1891 when Dr. Voelcker submitted his report on the "Improvement of Indian Agriculture" containing the result of an exhaustive enquiry made by him during the previous year at the instance of the Secretary of State for India. Discussion of his proposals led to the decision that the time had come for the appointment of an expert for the scientific investigation of problems connected with Agriculture. An Agricultural Chemist and an assistant were accordingly appointed in 1892. The first Inspector-General of Agriculture was appointed in 1901 but it was not till some years later that the scientific staff was strengthened by the appointment of a Mycologist and an Entomologist.

The development of an agricultural policy in Provinces has been on similar lines. A few words may, however, be said about Madras in particular as it has, on account of its proximity, had a good deal of influence on

the course of events in Mysore. Perhaps nothing impresses a new comer in India, especially if he is interested in such matters, so strongly as the comparatively low standard of life of the Indian agriculturist and the crude and primitive appearance of his appliances; and it is not surprising, if he should be led into the belief that the salvation of Indian agriculture lies in the wholesale importation of implements and practices from advanced countries. A full set of agricultural implements was got out from England and made over to the Saidapet Agricultural Farm which started work with a very ambitious programme. The raiyat did not take to these implements kindly and at the end of seven years, things had not moved forward appreciably. Then followed a period of reaction when nothing was done and the view was held in some quarters that the raiyat was conservative and did not know what was good for him and in others that he knew his business so well that there was very little that he could be taught. Attention to scientific agriculture in Madras may be said to date from 1901 when a farm was opened with the object of finding out varieties of sugar-cane resistant to "red rot".

Mysore was not slow to take advantage of the Saidapet College to which were sent students with scholarships for training. These men when they passed out were appointed to the Revenue Department and were expected to improve the agricultural practices of the country. The results were disappointing and, in course of time, these specially trained men were absorbed in the general establishment of offices. The desire to give a forward impetus to agriculture by the introduction of Western methods and appliances also gripped us and a goodly number of foreign implements were imported about this time. It was not uncommon in the very early days of the department to be asked to find use for implements some of them weird looking and of a by-gone type. We have had our period of stagnation too as

in other parts of India. The foundation of the Agricultural Department in Mysore was laid towards the end of 1898 when Dr. Lehmann was appointed Agricultural Chemist and the Laboratory attached to the Geological Department was handed over to him for scientific work. It was not until 1905, however, that the Hebbal Farm commenced its existence.

Agriculture is peculiar as it is not a science in itself but is very intimately related to others so that not one but a number of scientific officers are required for the proper conduct of work in an Agricultural Department. It should also be remembered that the executive district staff at this time consisted of two Agricultural Inspectors for the whole of the State. During this period therefore sufficient attention could not be given to district work but a good deal of necessary and valuable work was done in organizing the work of the Farm and the Laboratory.

As the result of representations made from time to time, a Mycologist and Entomologist was appointed in the latter part of 1907; but as the engagement of the Agricultural Chemist with the Government terminated about this time, the prospect of a fully staffed department did not come any nearer. The order of 4th May, 1912, sanctioning the organization of a department of Agriculture with Dr. Coleman as the First Director marks an epoch in the history of agricultural development in Mysore. It may be of some interest to examine what the department has been able to achieve during this period of five years that it has been working with a not hopelessly inadequate staff.

An increase of agricultural production may be brought about in the following ways.—

A.—1. By increasing the area under cultivation.

2. By providing irrigation facilities in tracts where rainfall is precarious or scanty.

B.—By increasing the outturn per acre—

1. By the introduction of higher yielding varieties of seed.
2. By the introduction of better cultural methods.
3. By the use of fertilizers.
4. By the control of fungus and insect pests.

C.—Indirectly by improving the economic condition of the raiyat—

1. By the substitution of money crops for cheap crops.
2. By providing cheap capital.
3. By the spread of agricultural education.

The above list does not profess to be exhaustive but it is believed that nothing of much importance has been omitted.

A.—The increase of area under cultivation depends upon factors like the density and the economic condition of the agricultural population and the encouragement of colonisation wherever necessary is an administrative question. Dr. Smeeth has recorded his opinion that conditions are such in Mysore that the supplies of water we can reasonably hope to obtain from wells will, as a rule, suffice only for legitimate domestic purposes but will not stand being wasted or diverted to other uses—such as the growing of garden crops. The chances of effecting an improvement in irrigation facilities would, therefore, seem to lie mainly in the direction of the construction of new irrigation works and improving tanks and this subject is receiving the continuous attention of a special department of the State.

B.—The measures under B on the other hand may be said to fall within the scope of the legitimate work of an Agricultural Department.

1. The seed ordinarily sown by the raiyat is a mixture and the first thing that should be done is to separate pure types, some of which may possibly yield more heavily than the mixture or possess some special characteristic like resistance to drought. As the result of work along these lines done with regard to *ragi*, the principal cereal crop of our State, several pure types have been isolated and the distribution of these improved strains has been going on for the past two years. At the end of the present sowing season seed sufficient for 8,000 acres of a strain which has been found to give a 30 per cent higher yield will have been distributed.

Comparative trials with a number of varieties of sugar-cane showed that Red Mauritius gave about 30 per cent higher yield than any of the local varieties, also that it flourished under varying physical conditions. Seed of this variety sufficient for 250 acres has been distributed up to date and its cultivation is spreading with encouraging rapidity.

Besides this, a great deal of work has been done on paddy but experimental work has not progressed sufficiently far to admit of an extensive distribution of improved seed just yet though the prospect of our being able to do so in the near future is bright. Considerable work has in addition been done with regard to the introduction on a restricted sale of improved seed of special crops like castor, groundnut, tobacco, turmeric, etc.

2. The use of the improved plough besides enabling the raiyat to cultivate more land more efficiently and in less time than the indigenous implement leads to greatly increased yield on dry land as experiments on the Hebbal Farm have shown. The scope for the introduction of improved implements is very great and attention was therefore

given early to this question. But the war conditions which have prevailed over the period under reference have not only raised the prices of these implements but also made it extremely difficult to get stock sufficient to meet the demand. Five thousand ploughs and cultivators have, however, been sold up to date.

The practice of transplanting single seedlings of paddy is being brought to the notice of cultivators in areas where broad-casting is the rule as it is found to produce better yields besides saving seed. The planting of cane also at wider intervals than what is usual in Mysore is for similar reasons being advocated. As a result of the work of the Department a large number of raiyats are now "selecting" the seed either by earhead selections or by the salt water method.

3. The use of improved implements and methods leads to heavier yields and consequently to a heavier drain on the soils of their valuable constituents. If the fertility of the land is to be maintained at a profitable level, the plant foods removed will obviously have to be made good by their addition in the shape of manures and fertilizers. This consideration will make it clear why any measures for increasing the outturn of land to be quite successful should be accompanied by measures for making available to the raiyats, manures easily and at reasonable cost.

The manure which the raiyat can most easily get and therefore which he commonly uses is cattle manure. This material contains all the foods necessary for plant growth and when preserved under proper conditions forms a very valuable manure. But as ordinarily stored, it is exposed to sun and rain and loses some of its useful ingredients. Its value is further discounted by the fact that the urine of cattle which is rich in plant food is allowed to run to waste. There is also the pernicious habit to be considered which is prevalent not only in Mysore but in other parts of India of burning cattle dung as

fuel. Dr. Coleman estimates the loss due to the improper storage and misuse of cattle manure at a hundred lakhs per annum. Stated in this way, the matter appears important enough to engage our serious attention. The department has from the beginning been teaching people how best to conserve cattle manure; there has been some progress but it has not been as rapid as one would wish.

The practice of green manuring which is a comparatively cheap method of improving and enriching the soil is not new to Mysore. It is prevalent in some parts in connection with the cultivation of paddy. The Department has made considerable progress in extending this practice in parts where it was previously unknown and to *ragi* cultivation in suitable areas.

With a view to popularise the use of oil cake for Sugar-cane which responds readily to application of nitrogenous manures, the department has been purchasing and selling oil cake to cultivators on credit since 1915. This system has been greatly appreciated and in spite of the increasing price of oil cake 2,237 tons have been issued up to date. This work is, however, likely to suffer a serious check on account of the high cost of oil cake at the present time. This high cost of oil seeds and the cake is an effect of the abnormal conditions set up by the war which has cut off all outside supplies of artificial fertilizers and has obliged the large planting industries to turn to oil cake as the source of their nitrogen. These industries know the value of this fertilizer and will buy it in spite of high prices while the average raiyat has neither the inclination nor the ability to compete with them for the oil cake. The effect is that a large portion of the oil seeds grown and of the cake produced in the State find their way outside the State. The war is happily now over and the imports of artificials into the country will probably be soon restored. As a result of the extra installations that have been put down in the

course of the war for utilizing nitrogen from the air, for the manufacture of explosives, the price of nitrates may also go down appreciably. Other things being equal, artificials being more concentrated will be preferred to oil cake which is bulky where transportation over long distances is involved. The outside market for oil seeds may for these reasons be expected to grow dull after some time and if some time their production in the State is stimulated, and an adequate number of oil-pressing installations are put down, the price of oil cake may come within reach of the average raiyat.

A mixture of bone meal and oil cake for paddy has been under trial for some time and the results obtained have been so encouraging that this manure will be distributed on a more extensive scale during the season.

The discovery of mineral phosphates in Mysore has not been reported and bones therefore form the chief source of phosphatic manure. The exports of raw hides and skins have been steadily rising during the past few years and as there are no indications that bone manure is used to any very great extent in the State, the large quantity of bones produced is either wasted or exported. As stated already, bone meal has a beneficial effect on paddy. Efforts therefore should be made to keep and utilize this within the State. The question of installing bone crushing plants deserves consideration in this connection. The manufacture of sulphuric acid if at all commercially feasible, would also help in the production of phosphatic manures in more easily assimilable form.

4. Soon after his arrival in Mysore, Dr. Coleman directed his attention to the investigation of *Koleroga* which had been playing such havoc in the areca growing areas of the State. As the result of long and laborious work in the Laboratory and the field, an efficient method of controlling the disease has been evolved and has found favour among the arecanut growers. The

life histories of the *Jola* grass-hopper and the *Kamblihulas* have been worked out and effective remedial measures recommended. The Pest Act which passed into law in 1917 has been in operation in restricted areas since last year. That no opposition was encountered but that on the other hand co-operation was forthcoming from the raiyats of these areas in the administration of the Act speaks, I think, for the efficiency of the remedial measures advocated and of the steps taken to bring these to the notice of the cultivators concerned.

Under C are mentioned a few measures which by improving his financial condition and thus enabling the raiyat to purchase improved implements, better feed and sufficient manure, indirectly contributes to the increase of agricultural production in the State.

(1) The proportion of area under food crops to that under non-food crops is 5: 1 for India and $5\frac{1}{2}$: 1 for Mysore.

It is essential, however, that the State should be independent in the matter of food grains of which more than what will suffice for the population of the State should be normally produced. So long as cattle are used for all agricultural operations, the question of sufficient fodder for them has also to be considered. Rather than attempting to reduce the area under food crops, endeavour, therefore, should be directed towards increasing the outturn per acre so that fresh areas taken up will naturally be devoted to more remunerative commercial crops.

(2) The rise of the co-operative movement in Mysore has been of great use to the agriculturist in helping him to obtain cheap capital when he needed it. It is desirable that societies of other types such as those concerning themselves with the purchase and distribution of improved implements, better seed and manure and the sale of agricultural

produce should spring up in larger numbers in the interests of the agricultural development of the country. This subject is receiving the attention of the departments of Co-operation and Agriculture.

(3) The subject of agricultural education also has received its due share of attention. There is first the large section of the rural population who are illiterate. The only way to influence them is by demonstrations of improved methods on their own fields. Talks on matters in which they are closely interested have also a certain value and gatherings at jatras, fairs, etc., have been made use of to the fullest extent. The number of such demonstrations and talks during the last five years runs well over a thousand. Short courses of a practical nature on special subjects have been held on the various farms of the Department. Then there are the boys in rural tracts. What is attempted to be given to these is not a regular agricultural course but one of nature study with an agricultural bias. This work is in the nature of an experiment still and is being done in co-operation with the Department of Education. Three schools only have been working on these lines for the last two years with a fair measure of success. The movement should be further extended before a definite opinion can be reached as to its value. The department had also something to do in training teachers for rural schools. There are lastly two special schools which give a regular agricultural course. One is the school at Chikkanhalli where the instruction is in the vernacular and the course extends over one year. Fourteen students have passed through this school. The second is the English school at Hebbal where the course is more advanced and extends to two years. Fifty-four students have passed out of the school of which twenty-four have found permanent employment in department, twenty-two are managing their own estates, eight are temporarily in Government service but will go back to the land when the appointments cease.

The publications of the department during the period under review are thirty-three in number comprising twelve bulletins, sixteen circulars and five annual calendars, besides occasional contributions on agricultural matters to the Press.

There are certain activities of the department the result of which cannot very well be estimated in terms of rupees, annas and pies; there are certain others which can to a certain extent be treated, but the figures obtained will, of course, be approximate. With this preface, it may be stated that the number of ploughs sold during the five years under reference have by improving cultivation yielded to the raiyats an increased revenue of five lakhs. The improved strains of *ragi* and the spread of the practice of green manuring will probably account for one lakhs. The planting of red mauritius cane, the application of oil cake and the adoption of better milling and boiling methods should have brought in to the cane growers of the State an additional sum of four lakhs. The spread of the practices of green manuring and single seedling transplantation has probably increased the revenue of the paddy growers by fifty thousand. The remedial operations against *Koleroga* will easily account for 1,25,000 by saving the arecanut crop in the malnad. With regard to insect pests, in one village for which definite statistical information is available the value of the crop saved from the havoc of the caterpillars may be estimated at 75,000; we are, therefore, quite safe in estimating the result of the remedial operations against insect pests in five years at 1,25,000. This estimate of 13,00,000 is increase directly due to the work of the department but it should be remembered that it takes no account of the distribution of improved seed or the spread of improved methods that we know takes place among the cultivators themselves without the direct intervention of the department. The yearly report moreover refers to work mainly with new clients and it is reasonable to suppose that people who

have found it profitable to adopt the recommendations of the department will not suddenly drop the improved methods they have learnt at the end of the year but will continue them. On these considerations, I believe it will be a conservative estimate if the one already given is raised to four times the figure or about 50,00,000.

The desire to see results rapidly is very natural but if carried to the extreme is likely to seriously retard agricultural development. It has been remarked that an expensive scientific establishment is unnecessary and that we had only to strengthen our executive staff and bring to the notice of cultivators the results arrived at by agricultural departments of advanced countries. The fallacy of this view has been proved time and again in the history of almost every Agricultural Department. Every measure recommended should be thoroughly tested with special reference to the tract concerned and this can be done only by patient scientific research work. A department of Agriculture cannot afford to make any mistakes as the confidence of the raiyat when once alienated is exceedingly hard to regain. The demonstration side of the department should be developed but the scientific side should also receive full encouragement. After all, scientific research is the one thing, that on account of the large expenditure involved, private organizations concerned with the agricultural development of a country cannot undertake and that therefore devolves on the Government of that country.

The Department of Agriculture in Mysore may be considered to have passed its infancy and to be now in robust childhood. The article may be closed with a hope that necessary provision will be made for its healthy growth.

AGRICULTURE IN MADRAS,

1917-18.

By "RUSTICUS."

MR. Stuart's latest Report on the working of his Department is so full of interesting and important matter as to render the task of comment more than usually difficult. The best way to deal with it will perhaps be first to note what has been accomplished by the Madras Agricultural Department in increasing the outturn and quality of the crops in the Presidency in the various ways in which this can be done, whether by giving out improved strains, by promoting the use of manures or by the introduction of improved implements or improved methods of cultivation.

It is in the southern cotton-growing districts of Madras that the greatest success has been achieved in giving out improved strains. In 1917-18, there were no less than 250,000 acres under these strains which are known as Company cotton and are at least an eighth of an inch longer in staple than the indigenous cotton in addition to yielding more heavily and possessing a higher proportion of lint to seed. Mr. Stuart anticipates that the indigenous mixture will, in a very short time, have completely disappeared, as there will be ample seed of Company cotton for everyone and there will be no inducement to sow anything else, Company cotton being worth at least Rs. 20 an acre more than ordinary cotton. A profit of Rs. 20 per acre on a quarter of a million acres means that the cotton-growing raiyats in the south of Madras benefited to the extent of Rs. 50 lakhs in 1917-18, as a result of the work of the Agricultural Department. The credit for this is entirely due to Mr. H. C. Sampson, Deputy Director of Agriculture, by whose patient research work the improved strains were evolved.

In the northern cotton-growing districts, the Department has not been so successful. The two selected strains which have been given out, Hagari No. 1 and Nandyal No. 2, gave a poorer yield on the Nandyal farm last year than did the ordinary local cotton. Mr. Stuart candidly admits that they are not good enough but has the satisfaction of reporting that others have been evolved which offer much more promise. One of these, No. 14, a strain of Northern, was considered by the Indian Cotton Committee to be one of the finest indigenous cottons they met during their tour. Unfortunately, the percentage of lint to the total outturn of seed and lint is low so that, if the new strain is to spread, the cotton trade will have to pay a premium for it which will more than make up for this. Whether it will be willing to do so remains to be seen. No. 25, the new strain intended for the Bellary district, is somewhat weak in staple which makes further trial necessary before it can be put out on a large scale. The cottons of Madras have such a good reputation for staple that it is satisfactory to know that the short staple intruder, *pulichai*, has been completely ousted from the southern districts and that, in all probability, a similar fate will befall its relative, *roseum*, which has recently made its appearance near Adoni. The Agricultural Department is confident of being able to find a strain suitable for the red soils in that tract which will combine the high yield of *roseum* with a staple about a quarter of an inch longer.

Substantial progress has also been accomplished with selected strains of paddy. The yield from selected seed of the local variety in Tanjore has been heavier, the ripening more even and the price obtained higher than that of the ordinary variety. Even better results are expected from the pure strains which Mr. Parnell, the Economic Botanist, has evolved. Two of these are to be tried in the Coimbatore District on a field scale whilst others under trial at Manganallur will

be given out in the Tanjore District as soon as they have been thoroughly tested on the farm. Mr. Stuart has some interesting comments on the possibilities of the work on paddy. He points out that the value of the paddy crop in Madras is over sixty crores of rupees annually and that Mr. Parnell's work on the crop shows that this may eventually be increased by 20 per cent merely as the result of sowing pure seed of selected strains.

Of the numerous varieties of sugar-cane which were tried on the farms, J.-247 has been selected for distribution in the Godavari delta on account of its high yield and freedom from disease but it has not yet 'caught on' owing to the greater difficulty in crushing it. The Agricultural Department has not neglected the dry grains which form such an important part of the dietary of the poorer classes in Southern India. An improved strain of *ragi* which can be given out has been evolved at Hagari but further trials are necessary before any of the selected strains of cholam (jola) can be tried on a field scale. The research work on the coconut which was commenced during the year on the West Coast deserves to be mentioned.

In these days of high prices, it is, as Mr. Stuart says, necessary to do everything possible to increase the available supplies of food grains. He holds that the best way to do this in Madras is by better manuring of paddy. Green manuring is making rapid progress and the difficulty now is not to sell seed but to obtain fresh supplies of it. There are, however, limits to the possibilities of green manuring and to obtain still better yields, the use of artificial manures is indicated. Experiments have shown that insoluble phosphatic manures such as bone meal and mineral phosphates are rapidly decomposed and used up in paddy soils in the presence of organic matter. It is fortunate that this should be the case as these manures are considerably cheaper than the soluble

superphosphate which depends for its manufacture on sulphuric acid which is scarce and expensive. There is a large supply of mineral phosphate available in the form of nodules in the Trichinopoly District within a few miles of the great paddy growing tracts of the Tanjore delta. It has now been established that this form of phosphate can be readily used by the paddy plant so that the exploitation of this source of supply is a matter which should be taken up seriously and immediately. The manurial experiments with other crops were numerous but the results were not so important as in the case of paddy. A combination of castor cake and cattle manure was found to be the best manure for sugar-cane. Sulphur was tried as a manure for groundnut but the experiment was unconvulsive.

The most important work done by the Agricultural Department in promoting the use of improved implements and of improved methods of cultivation was in the Tinnevely tract, where 208 sets of drilling and inter-cultivating implements were sold against 111 sets the previous year. This is satisfactory evidence that the ryot is gradually becoming convinced of the advantages of drilling. It is uphill work, however, and the area drilled in 1917-18 was only 19,000 acres which was 4,000 acres more than in the previous year. Little could be done to push other improved implements owing to the impossibility of obtaining them even at higher prices. Seventy-seven light Monsoon iron ploughs were sold as well as a few locally made implements but heavy iron ploughs and disc ploughs were not to be got at any price and such stock as there was surrendered for use in Mesopotamia.

The primary aim and object of the Agricultural Department is to secure an improvement in the yield and quality of the various crops. The constant war which it wages against diseases and pests is an indirect method of obtaining this result. On the

entomological side, there was little progress to record during the year. The preventive measures against the stem weevil, a serious pest of Cambodia cotton, which were tried on the Coimbatore farm, did not prove very successful. This is unfortunate as the presence of the pest is now being reported from the Madura and Tinnevely Districts. The "pollu" disease of pepper has also to be investigated. There was greater activity on the mycological side. A serious disease of paddy reported from part of the Tanjore District seems likely to be stamped out by the extremely simple method of growing varieties which are immune to it. The palmyra disease which has worked such havoc in Godavari and Kistna has, in Mr. Stuart's opinion, been reduced to the lowest terms possible with the agency available. The work of combating the *mahali* disease of arecanut trees and of preventing smut in cholam, cumbu and Italian millet is greatly hampered by the unwillingness of the ryots to incur any expenditure on it themselves. At present they only pay the cost of the chemicals used in spraying the arecanut trees and have still to be educated up to owning jointly or even to renting sprayers. The very small charge of half an anna which is the cost of the copper sulphate required to treat enough cholam seed to sow an acre was sufficient to reduce the area in the Bellary and Kurnool Districts sown with treated seed from 21,790 to 11,200 acres. We entirely agree with Mr. Stuart that, once a start has been made the policy of charging the raiyats for materials in such cases is the correct one. The Agricultural Department can only deal with a small part of an affected area. It has no guarantee that a practice has really taken root and will spread unless the raiyat buys the material of his own accord.

Sugar-cane is such a valuable crop and India's dependence on foreign exports has grown to such an extent in recent years that

the spread of sugar-cane cultivation in Vizagapatam, Kurnool, South Arcot and South Canara is worthy of mention.

It is disappointing to read that both in numbers and in quality, the applications for admission to the Agricultural College were below the level of recent years. Mr. Stuart attributes this to the fact that the Intermediate Examination of the University of Madras can now be taken piecemeal and that it is easier to obtain entrance to Government service *via* the University Examination than it was formerly. This is only additional evidence that there is still little demand for agricultural education for its own sake, a matter for great regret to all who have the true interests of this country at heart. It is some consolation to know that the students actually in the College were a good lot as is shown by the results of the Examinations. All who appeared for the Diploma examination passed whilst 32 out of 34 obtained the certificate of Proficiency in Agriculture.

We are especially glad to see that, during the year, much was accomplished in securing closer connexion between the Agricultural and Co-operative Departments. In the past, one department has often exploited a tract which the other could not take up for want of staff or other reasons. In future, both Departments will make special efforts to concentrate on the same tracts. The Co-operative Department will also pay special attention to the provision of cheap credit for the class of non-occupancy sub-tenants who are the real cultivators of the soil in so many parts of Madras and whose poverty is so great an obstacle to the progress of agricultural improvement. Mr. Stuart adds that, as a result of the conference between the two Departments, some progress was made during the year and considerable experience was gained. The adjectives he uses have evidently been carefully chosen for, judging from the details he gives, the experience was

much greater than the progress. Some Co-operative Credit Societies commenced the joint sale and purchase of agricultural produce and requirements. The District Agricultural Associations all over the Presidency, which might be a useful link between the Agricultural and Co-operative Departments, seem to be either dead or dying.

In conclusion, mention must be made of the excellent work done by the Agricultural Department at the Madras Exhibition of 1917. All sections did well but the gold medal was borne off by the Agricultural Chemist and his subordinates whose exhibits showed that patent breakfast foods, invalid foods, molted milk foods, photographic printing art paper, washable paint and boot polishes to mention a few examples, could be prepared from materials available in India. Whether they can be made at a profit is another matter, but to quote Mr. Stuart again, the first step is to demonstrate that they can be made. In these days, all sorts of new industrial enterprise are being feverishly promoted in Calcutta and Bombay, capitalists with judgment and enterprise might do worse than turn their attention to the possibilities foreshadowed by the work of the Madras Agricultural Department.

The Report of the (British) Inquiry Committee on Paper Supplies recommends that paper manufacture be regarded as a key industry. Without necessary supplies of paper, no Government can hope to carry on immense propaganda campaigns which were so successful during the recent war.

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A Sugar Commission to explore the possibilities of the sugar industry will shortly tour in India. Mr. McKenna will be the chairman. Three members will be appointed from England. The Hon. Mr. Lalubhai Samaldas, C.I.E., has accepted a seat on the Commission. The Commission's enquiry is expected to last some eight or nine months.

INDUSTRIAL CO-OPERATIVE SOCIETIES.*

BY MD. MAHMUD,

Joint Registrar of Industrial Co-operative Societies, Bengal.

THE Industrial Branch of this Department has been started with the idea of helping the artisans and craftsmen of Bengal to improve their lot and to increase the country wealth by means of co-operation. Before entering into a discussion of matters co-operative let us first consider what are the principal cottage industries of Bengal and which of them deserve special attention in this connection. In this paper I propose to deal only with the "useful" industries and shall leave out of account the artistic industries like ivory-carving, *bidri*-work gold and silver wares and the gold and silver and *chikon* embroideries.

It is well-known that the principal cottage industry of this Presidency is weaving. Among the vast population engaged in this industry the most numerous are the cotton weavers, next to them come the silk weavers and then the wollen blanket and carpet weavers. The weavers are divisible into two broad classes, *viz.*, the highly skilled weavers of specialised cloths and the common weavers who weave cloths principally because it is their caste profession and their only means of livelihood. Under the former class might be mentioned the *matka* weavers of Malda, the *matka* and *garad* and flowered silk weavers of Murshidabad, the tussar weavers of Birbhum and Bisnupur, the muslin, jamdani and kashida weavers of Dacca and the fine *sari* weavers of Bajitpur in Mymensingh and Santipur in Nadia. Under the

* A paper contributed to the Tenth Provincial Conference of the Co-operative Societies in Bengal. With acknowledgments to the Official Report.

later category come the Tantis and Jolabs, scattered all over the province, who weave coarse *dhotis*, *saris*, *chadars* and *gamchas*.

Allied to the silk weaving industry are silk-worm rearing and silk reeling which are carried on to a large extent in the districts of Malda and Rajshahi. Silk reeling is so far behind silk-worm rearing that hundreds of maunds of cocoons are exported annually from the above districts to Murshidabad, Benares and other places. And, owing to the decadence of the weaving industry large quantities of reeled silk have to be exported to foreign countries. It need hardly be pointed out that there is therefore considerable room for improvement in the silk reeling and silk weaving industries.

Next in importance are the brass and bell-metal industries the principal seats of which are Bishnupur in Bankura, Nalhati in Birbhum, Kharar and Ghatal in Midnapore, Khagra in Murshidabad, Bansberia in Hooghly, Ranaghat in Nadia, Malda town, Natore, Dhamrai in Dacca and Kagmari and Islampur in Mymensingh. The most important products under this head are household utensils. Brass padlocks are produced by cottage workers in some places round about Calcutta, and the activities of the Indian Munitions Board during the recent world-war have demonstrated that Indian cottage brass-smiths can manufacture brass buttons, hooks, loops, slides, etc.

The weavers and the brass and bell-metal workers work under a system according to which most of the profits go to the middleman and the actual producer gets bare living wages. The *mahajan* or the *bepari* supplies the weaver or the brass-smith with the raw material and afterwards takes away the finished product from him paying him wages at the lowest rate possible. In fairness to the *mahajan* it must be admitted that this system is not without some advantages. It saves the weaver or brass-smith the trouble of obtaining raw material and selling his product, and the *mahajan* often helps the man

by paying in wages in advance or giving him loans in times of stress. But the fact remains that major portion of the fruits of the man's labour goes to the *mahajan*, and the producer is left in poverty and ignorance, as indeed the *mahajan* wishes him to remain.

The metal industry is somewhat more complicated than weaving, for in all the large centres it is worked under a semi-factory system, so that there are two grades of middlemen between the producer and the market. The middlemen of the first grade, who is generally a big trader in Calcutta, lays out the order with the middleman of the second grade, who is often of the more prosperous brass-smiths in the village. The latter brings together some poor brass-smiths and gets the article turned out by them in his workshop. He pays them the bare wages and supplies the articles to the Calcutta man at the highest rates he can get him to pay.

Mention must next be made of ^{the} chank-shell and horn manufactures of Dacca. From very early times there are settled in the town of Dacca a colony of men known as *shankharis* whose sole profession consists in making bangles, ring and other trinkets from chank-shells. The shells are imported from Tuticorin in the Madras Presidency and from Ceylon, and the manufactured articles are used by Hindu women of all classes in Bengal. There are other classes of persons in and round about Dacca and in a place in the Brahmanbaria Sub-division of the Tippera district, who manufacture large quantities of buttons from mother-of-pearl. This industry is of recent growth, some say it originated with the *swadeshi* movement. The pearl-oysters are fished from the inland streams in Eastern Bengal by a class of men known as *badias*, principally for pearls. The oysters are opened by them, the pearls, if any, taken out and the shell pieces left in heaps on the banks. These heaps are purchased at nominal prices by another class of persons known as *chunaris* who burn them in small kilns and make lime for human

consumption with betel-leaves. Since the introduction of button-making, the shells fished in the neighbourhood of Dacca and Narayanganj are purchased by the button-makers and are converted into buttons which find ready sale in Dacca and Calcutta. There is great scope for expansion of this very useful industry. In view of the fact that enormous quantities of rock lime are available in the neighbouring district of Sylhet, East Bengal has no necessity for using shell lime. All the pearl oysters fished by the *badias* can be available for the button-makers, and Bengal can, with a little organization, be in a position not only to supply her own needs in the matter of buttons but to export some to other provinces.

The manufacture of combs from horns used to be carried on at Dacca from time immemorial. Recently they have begun to make buttons from horns, and a great impetus has been given to this new industry by the large orders laid out by the Munitions Board. The Colonisation Officer of Bakarganj tells me that if the horns lying in the buffalo-grazing areas in the Sunderbans were collected there would be sufficient material for thousands of gross of buttons. And I know of similar areas in the islands of Dakshin Shahbazpur, Hatiya and Sandip where very large quantities of horns are lying and rotting to waste.

Another industry which should have been mentioned with weaving but which has an importance all its own, is carried on in many villages in the districts of Tippera, Dacca, Bakarganj and Pabna by a class of men known as *Kapalis*. These people twist jute twine by hand and weave gunny cloth with it in a very crude and laborious process. Their products are better than mill-made gunnies, but the price does not in all places compare favourably with that charged by the mills. Some improvements have already been made in this industry in the sub-division of Brahmanbaria and efforts are being made to introduce a simple machine for twisting

the thread and the fly-shuttle loom for weaving the gunny. Having regard to the fact that almost every cultivator in East Bengal produces jute one can easily imagine what great potentiality there is in this industry. There is not likely to be any caste prejudice against it, and, in the words of Babu Naba Gauranga Basack, the late Sub-divisional Officer of Brahmanbaria, every cultivator can work at it in his slack season and make his maund of jute pay Rs. 30 instead of Rs. 10.

The districts of Noakhali, Dacca, Faridpur and Jessore are very rich in date palm, and large quantities of sugar-cane are produced in the districts of Bakarganj, Pabna and Birbhum. For want of knowledge and means the cultivators cannot provide themselves with cane-crushing and sugar refining plants. It is conceivable that with proper organization the cultivators of Bengal could produce considerable quantities of sugar and thus enrich themselves and the country.

Similarly, with organization and co-operation, the *Kolus* (professional oil-pressers) in the oil seed producing areas might be able to make much more money than they do now and the country could get a more plentiful supply of pure oil for consumption.

Another important industry consists in the manufacture of bags and baskets from cane and of mats from reeds and grasses. The texture of the old-fashioned cane *petaries* of of Sherpur and Char Iswardi in the Mymensingh district is an object of wonder to many and is fit to win prizes in any Exhibition; and the cane-boxes, trays and luncheon baskets made for the Bengal Home Industries Association by the basket-makers of Brahmanbaria bear eloquent testimony to their skill. The mats manufactured at Sabong in the Midnapore district are too well-known in Calcutta to need any introduction, and the *sitalpatis* made in the Mymensingh and Pabna districts, though not so fine as those of Sylhet, are very useful and are extensively used by the common

people. There is, therefore, no reason why the people of Bengal should not satisfy their needs for this class of furniture with country-made goods in preference to those of Chinese or Japanese manufacture.

Bengal had her own cottage gun-smith at Bonpas Kamarpara in Burdwan district, and there were makers of cutlery in several places in the province. Remnants of the latter are to be found at Kanchannagar in Burdwan, Brahmanbaria in Tippera, Duttapura in Noakhali and Uzirpur in Bakarganj. In and round about Calcutta there are blacksmiths who make nuts, bolts, rivets, etc., in pursuance of orders laid with them by certain firms of Engineers and Contractors. While I am doubtful whether our cottage blacksmiths can compete with the power-driven iron-works, I must at the same time say that they have a chance of improving their condition if they specialise in some things, e.g., tea-pruning knives, pen-knives and small agricultural implements.

There are in Bengal an indigenous class known as *Rishis* and a class of settlers known as *Muchis* whose profession it is to tan leather with bark and to make shoes for sale. Some of them have now taken to buying tanned leather for making shoes. Owing to the competition of the mill-made shoes the number of these shoemakers is dwindling gradually. But anyone looking at the prosperity of the Chinamen working in Bentinck Street cannot but feel that there is every chance of our succeeding in bettering the condition of the *Muchis* and *Rishis*.

Another industry which is of great national importance is that of milk supply, for on it depends the physical well being of future generations. The question of milk supply is much more acute in the case of towns and cities than in that of villages, and it is in the neighbourhood of the larger towns that the milk industry can be carried on on an organized basis. It is calculated that on an average about 250 maunds of milk is brought into the Calcutta market every day from

villages in the Baraset Sub-division. By organizing a few co-operative societies in that area this Department has already succeeded in providing a daily supply of nine maunds of milk to Calcutta. I need hardly add that given the necessary staff and facilities, we can do much more. In the town of Dacca something was tried in this direction through co-operative societies.

Anyone acquainted with Bengal knows that the province is very rich in fisheries and that a vast population of *Jhalos*, *Malos*, *Nikaris* and others live by catching and trading in fish. According to Mr. Southwell there is much scope for improvement in this industry.

Among minor industries may be mentioned paper-making, which is carried on to a small extent in cottages in the districts of Howrah, Hooghly, Murshidabad, Pabna and Dacca, and pottery and toy-making, which are carried on in the districts of Birbhum, Nadia, Tippera and Dacca. A gentleman of Brahmanbaria has invented a small machine for manufacturing safety matches, but it is still in the experimental stage.

It is a patent fact that our cottage workers, as a class, are wholly illiterate and owing to the gradually decadent state of their industries they have lost the enthusiasm for learning good work and becoming efficient craftsmen. So, if we mean to revive our cottage industries the first thing to do is to rouse their ambition and to widen their outlook in life. The next is to indicate the means by which they can improve their condition. The leaders of thought in this country, both official and non-official, have come to the conclusion that co-operation is one of the means by which the artisans can work out their salvation. By banding themselves together in co-operative societies, that is to say, by pooling their resources and offering joint liability, they can improve their credit; and by combining for purposes of production and sale they can buy raw

materials on advantageous terms and sell the finished products at much greater profits. Through co-operation they will be able to adopt improved methods of production. The majority of our weavers work with old throw-shuttle looms. One of the first things a co-operative weavers' society can do is to rise a loan and provide each member with a fly-shuttle loom, thus increasing production by at least 30 per cent. The blanket weaver can double the value of this product by weaving the blanket in one piece in a fly-shuttle loom instead of in four pieces as at present. And the shoemaker can improve and increase his output by providing himself with small hand sewing machines like the Chinaman's. The brass-smiths can erect co-operative worksheds and accelerate production by working with power-driven lathes.

The chief difficulty with most Industrial Co-operative Societies is the fact that their members cannot offer landed security, and the Central Banks which are the chief financing agencies, naturally hesitate to give them loans. Fortunately, however, the men at the helm of affairs in the Central Banks are educated men who are realising more and more everyday that to bring about the industrial regeneration of the country some risks must be taken. Another difficulty is the illiteracy prevailing among the industrial classes and the paucity of men who can write the books and accounts of the societies. This necessitates much closer supervision in this case than in the case of ordinary credit societies. One other difficulty we have to face is the opposition of the *mahajans* and *beparis* who have up to now been deriving large profits by acting as middlemen. They naturally view the co-operative movement among the villagers with disfavour. They are always ready to circulate all sorts of wild rumours and to impute sinister motives to those who try to organize societies. They refuse to take over the co-operative craftsman's products for sale, and as most of the craftsman owe them

money they often threaten them with suits for immediate recovery of the loans.

In paragraph 266 of their report the Indian Industries Commission have expressed the opinion that "before any such (agricultural or industrial) movement can be organized the ground must be usually prepared by the educative influence of co-operative credit, the simplest and most readily accepted form of co-operation in this country." In Bengal industrial societies were first started on the above principle, but it having been found that in many cases the loans taken by weavers for purchasing raw materials were often squandered away, cash advances to individual weavers have had to be stopped; the society now takes loans from the Central Bank, purchases yarn and distributes it among the members. It must, however, be recognised that there are bound to be two classes of industrial societies, *viz.*, industrial co-operative production and sale societies and industrial co-operative credit societies. I will make myself clearer. Suppose a number of prosperous weavers in Santipur decide to form a society and purchase yarn from a mill or a merchant at Calcutta and export their woven cloths to Calcutta merchants without reference to any middleman. The funds for the business of this society are raised by subscriptions or deposits from the members and the work is conducted without outside financial assistance. Now, take the case of a society formed amongst silkworm rearers in the district of Rajshahi. These men require money for buying mulberry leaves for feeding the worms and unless the money is forthcoming they cannot get along. And experience has shown that societies amongst fishermen are mere credit societies, because it is impossible to get the fishermen to keep accounts of their catches and sales.

At present there are the following industrial societies at work:—

Industrial Union	...	...	1
Weaving Cotton	...	...	78
„ Silk	...	...	2

Weaving Blanket ...	...	1
Silk reeling ...	...	1
Silk-worm rearing ...	...	1
Milk supplying ...	...	9
Fishery ...	...	24
Shoe-making ...	...	4
Toy-making ...	...	1
Oil pressing ...	...	1
Irrigation ...	...	1

Most of these have been organized by the officers of this department with the help of local gentlemen. But it will be readily seen that we have not yet touched even the fringe of our industrial field. The departmental staff is limited and their more important duty is the supervision and guidance of the existing societies. So unless non-officials co-operate with us in large numbers and devote some time and attention to the organization of Co-operative Societies amongst the artisans and craftsmen our progress must needs be very slow. Though the movement is for his benefit, the industrial worker as a class is so conservative and distrustful that he takes a lot of persuasion to join a Co-operative Society. It is only by constantly dinning the principles and benefits of co-operation into his ears that he is to be made to do so. Herein lies a great field for activity for patriotic Indians. For any one having the welfare and progress of his country at heart cannot but see that industrial co-operation is bound to be directly beneficial to the country. It is real social service and service of the motherland.

In this country there are two schools of thought in the matter of industrial progress,—one holding that we should neglect our home industries and take at once to the factory system, the other maintaining that our artisans and craftsmen should continue to work in their cottages as before and should not be dragged into the smoke laden and morally unhealthy atmosphere of the large cities and factory towns. The former are apt to forget the old saying that Rome

was not built in a day, and the latter lose count of the fact that in this age of race for progress there can be no such thing as remaining stationary,—he who halts must be left behind. The more rational solution seems to be for the country to advance by steps from the individual cottage worker to the co-operative combination or small co-operative factory and then to beg in industrial enterprises. This would, in the words of Sir Daniel Hamilton, be building from the village upwards. A striking example of what co-operation can do is afforded by the Naogaon Ganja Cultivators Co-operative Society; and I see no reason why we in Bengal should not think of starting co-operative jute mills, rice mills, oil mills and sugar factory.

The best way to proceed would be to divide the province into industrial blocks and to found an industrial Central Bank or Union in each of them. These bodies should make it their business to organize industrial societies, to finance and supervise them (of course, in collaboration with the departmental staff) and to help them in procuring raw materials and disposing of their finished products. One such Union already exists in Bankura and another is on the anvil at Dacca. The need for such an institution is being increasingly felt with increase in the number of weavers' societies. Such societies have to be very carefully nursed in the beginning, and when they begin to make some progress it becomes necessary for some intelligent body to help them in getting yarn and selling their cloth. It has already been said that the *mahajan* deserts the member of a Co-operative Society, and the members are so illiterate that they cannot write to a mill or merchant for yarn, nor do they know where the article can be had. It, therefore, devolves on the Union to correspond on their behalf and to get them the yarn. Then, when the cloths are woven the *bepari* will not take them over for sale, and the members are so poor that if the cloth does not

sell quickly they will have to starve. It, therefore, becomes necessary for the Union to either find a market somewhere and send the cloth there or to take the cloth over and stock it for future sale and then advance further money or yarn to the society for its work. In short, we cannot secure the profits to the workman unless the middleman is eliminated, and unless we can found Unions which will undertake the work that the *bepari* used to do and take the risks that the *bepari* used to take the co-operative societies cannot make headway. The Indian Industrial Commission have expressed themselves on this point in the following terms:—"The problem is to find an outlet for his (weaver's) increased production, and efforts to improve the lot of the handloom weaver must end in failure, unless attention is concentrated to a much larger extent than has hitherto been usual on commercial questions, which involve the purchase of raw materials, the selection of suitable designs and patterns and the establishment of commercial agencies for disposal of goods" (paragraph 144 of Report.) To keep the Unions well posted with commercial information and to help them in disposing of their stocks it is necessary that there should be a central institution in Calcutta. It may either be a branch of the Co-operative Federation or be a provincial co-operative Industrial Union. Such a body will be in a position to take expert advice in matters of designs and sources of supply and sale from the Director of Industries and the Department of Commerce and to pass on the advice and information to the mofussil Unions. It could maintain a parallel list showing the places where certain articles are produced and the places where they are consumed. The information furnished by such a list would be of immense advantage to the societies, for they could then enter into direct correspondence with consumers and could send their products to them. There might even be exchange of articles between two co-operative societies in two places. I will

illustrate this by a recent incident. The Bankura Industrial Union had in stock a few hundred pairs of *dhoties* woven by the members of co-operative societies under it. The Registrar of Co-operative Societies showed samples of them to the members of the Bakarganj-Sunderbans Co-operative Supply and Agricultural Sale Society. The latter society has ordered 100 pairs of those *dhoties*. It will probably pay in cash this time. But in view of the partial failure of crops in Bankura this year it is very likely that the weavers of Bankura will import rice, and it is quite possible that they will take it from one of the consignments that the Sunderbans Society sends to Calcutta at intervals of four or five weeks.

A Central body of the proposed type could keep a stock of yarns, metals and other raw materials and issue them to the mofussil societies at the lowest possible prices. We have heard of a Central Weaving Supply Institute at Benares which apparently works on such lines and receives either subsidies or loans from the Board of Industries of the United Provinces. (I must confess that I have not yet been able to gather accurate information about the above institute). And lastly, such a society could take over the surplus produce of the mofussil societies and sell them in opportune moments and in the best markets.

Owing to the competition of the mill-made goods and to frequent fluctuations in the market the district Unions and the provincial Union may at times incur some losses in selling their stocks of co-operative products, but such risks are worth taking. The Indian Industrial Commission have said, "In view of the importance of improving the position of the cottage worker, where he is handicapped, as at present, by the want of a free sale for his goods, it is justifiable to incur some risks in experimental efforts" (paragraph 268 of Report). Government could help the co-operators in this matter by

furnishing guarantees or rendering financial assistance.

To bring about increased production three things are necessary :—

- (i) to increase the efficiency of the artisan by general and technical education;
- (ii) to introduce improved tools and time and labour saving appliances; and
- (iii) to supply raw materials, to introduce new designs and to find wider markets.

On point (i) above, the Government and the public have before them the valuable suggestions of the Hon'ble Mr. J. G. Cumming, Mr. Gupta and the Indian Industrial Commission. Some hints on point (ii) have been given in paragraph 15 of this note, and some aspects of point (iii) have been discussed in the foregoing paragraphs.

To accelerate the sale of our cottage products the desiderata are Government patronage and public patriotism. A happy combination of these two is to be found in the Bengal Home Industries Association which has already achieved so much success. In a speech delivered in the Bengal Council on the 26th July 1915, the Hon'ble Mr. (now Sir Nicholas) Beatson-Bell said "One of the chief advantages of these societies (co-operative societies of weavers and other workers) will be that they will facilitate the working of the Government patronage of Indian Industries." The Indian Industrial Commission have recommended that Government should purchase stores as much as possible in India. We may, therefore, safely assume that Government patronage will be extended in all deserving cases.

But what is still more wanted is that the people should buy and use the products of their own country. Charity begins at home, they say. We must even be prepared to make some sacrifices in order to give an impetus to our home industries. If, with

such noble objects in view, we discard many of the foreign luxuries and satisfy our needs with country goods we shall, in the words of late Lord Minto, be practising real 'honest swadeshi' to which no one can take exception.

It is a maxim of political economy that supply is induced by demand. But the activities of Germany and Japan in recent times have established it as almost a truism in the commercial world that demand is often created by supply. We have to bring about a modification in the tastes of the present generation and make them patronise our home products by taking the articles to their doors and offering them for sale. The most effective way of doing this is to have a large number of co-operative stores dotted all over the country and to get them to deal in all countrymade goods and in the products of co-operative societies in particular. One of the quickest ways would be to offer our wares for sale in the co-operative stores that have been started in some colleges in Calcutta and in the mofussil. We should thus be rousing the patriotic and practical instincts of our future citizens, the young men in the University.

The District Unions and the Central Union should have industrial co-operative museums attached to them. They should advertise their products widely and should send goods to the exhibitions held annually in the several parts of this province as well. Until a Central Union is started at Calcutta its functions should be discharged by the Industrial Branch of the Co-operative Department. The Departments should be provided with funds for the work of development, advertisement and exhibition.

THE INDIAN EXCHANGE PROBLEM.

BY PROF. K. T. SHAH, B.A., B.Sc.

When the last Royal Commission on Indian Currency and Finance wrote:

"Our view is that India neither demands nor requires gold coins to any considerable extent for purposes of circulation (as opposed to saving or hoarding), that the *most generally suitable media* of internal circulation in India are at present *rupees and notes*, and that the Government should, as opportunity may offer, encourage notes, while providing,—*and this the cardinal feature of the whole system*,—absolute security for the convertibility into sterling of so much of the internal currency as may at any moment be required for the settlement of India's external obligations." (Para 76).

none of the members of that body envisaged or contemplated a situation at all similar to the one that has developed as the result of the influences at work during the War period. For sixteen years after the value of the rupee had been fixed at an arbitrary figure, 1s-4d, it was so maintained; and facilities were offered for the conversion of the rupee for purposes of settling India's international obligations or dues within points ascertained to represent the cost of transport of bullion to and from India. In the first days of the War the situation was so far similar to that contemplated by the Chamberlain Commission that the Government, acting in the spirit of the Commission's recommendations, had to afford a guarantee for the maintenance of the exchange value of the rupee in terms of the international medium of payment: Gold. For the first few months of the War the guarantee was practically utilised, and Reverse Councils to the total amount of £8'7 million were sold in India to be paid in England out of the Gold Standard Reserve. From and after the commencement of the Financial year 1915-16, the situation began to alter perceptibly. The large outlay of the Govern-

ment of India on behalf of the British Government, increasing every year in amount, more than balanced the obligations of the Government of India payable in England as Home Charges. The invisible Imports of India averaging £20 million a year, were thus met by the recoveries of the Secretary of State from the British Exchequer, and one greater factor in influencing Indian Exchange was temporarily reversed. On the other hand, as the War continued trade began to be adjusted to the new conditions; the exports of Indian produce began to increase in value if not in quantity, thanks to the urgent War demands of the Allies; and, on account of diversion of freight for military transport purposes, and later on on account of its absolute scarcity combined with the change in English industrial organization for the production of munitions, the imports of foreign produce into India began to diminish. A large balance thus arose in favour of India, which was all the more significant because the old converse stream of payments from India in the shape of Home Charges had dwindled into nothing. The prevalence of high Income and Property taxes in the United Kingdom, had moreover, induced the English merchants and capitalists in India to postpone the remittance of their profits to England, and to re-invest them in Industrial or other securities in India itself.

The mechanism of Exchange was thrown out of gear. The Councils, originally used to meet the Home Charges, were, according to the recommendations of the Chamberlain Commission to be used to liquidate the trade balance if the resources of the Government permitted*. They were now used (since the

*"It may be said that it was necessary for Government to supply up to the limit of their power the demand of trade for funds in India. We have already said that we do not favour the view thus implied. The interests of trade are, indeed, of high importance, but it is not the business of Government to favour trade at the expense of general revenues." (Report.)

Financial year 1915-16) almost wholly for purposes of trade balance. In the first year of the period (1915-16) Government maintained at the fixed rate of exchange an unlimited sale of Councils sufficient in fact to meet and liquidate the entire balance in favour of India. But the strain began to grow as each week a larger amount was demanded. The encashment of the Council Bills at the Treasuries of the Government in India, or at the Presidency Banks was to be made in rupees or Notes, which could only come from reducing the Government balances, or increasing the invested portion of the Paper Currency Reserve and thereby freeing an equal amount of rupees for circulation. Put briefly the financial position of the Government of India in 1915-16 was thus: The estimated outlay on account of the British Government was £18'6 million or nearly 28 crores of rupees. Councils were sold in that year for Rs. 30'36 crores. Against these the Home Charges totalled Rs. 30 crores; the Fiduciary Reserve against the Paper Currency was increased by 12½ crores for investment in England; and Rs. 11½ crores were obtained from the Gold Standard Reserve. The balance was made up by new coinage and by reduction of Government balances. In the next year the recoverable expenditure amounted to £38'5 million, against which were to be set off Rs. 32 crores in respect of the Home Charges. Councils were sold to the tune of 49 crores thus creating a total rupee need of 75 crores in round figures. This was met by the Revenue surplus, (including loans raised) of 49 crores, and new coinage of nearly 31 crores. The invested portion of the Paper Currency Reserve was also increased by another 28½ crores. The excess was used to purchase silver and make further investments in the British War securities on behalf of the Gold Standard Reserve. The position for 1917-18 and 1918-19 is represented by the subjoined table:—

Position in 1917-18.

(The figures are taken from the Financial Statements.)

Recoverable expenditure	...	£. m.	65'0
Council Bills	...	"	35'3
Special Recoveries	...	"	2'1
Increased receipts from Foreign Money orders	...	"	5'3
Subscription to Indian War Loan in England	...	"	1'1
Total	...	"	108'8
Ordinary Home Charges including Capital expenditure	...	£. m.	25'0
Silver purchase	...	"	13'5
Payments to British Treasury (India's War contribution)	...	"	35'1
Investment in English Treasury Bills. (Paper currency reserve)	...	"	8'7
Investment in Coinage profits (Gold Standard Reserve)	...	"	1'4
Special investment in English Treasury Bills	...	"	20'0
Discharge of Indian Debt	...	"	2'1
Miscellaneous	...	"	0'4
Total	...	"	106'2

Position in 1918-19.

Recoverable expenditure	...	£. m.	76'0
P. O. and M. O. Charges	...	"	4'2
Excess of Treasury Bill payments over receipts	...	"	10'7
Re-payment of temporary loan from Bank of Bombay	...	"	2'7
Council Bills	...	"	20'6
Cost of Military stores	...	"	12'7
Rupee credit for Fideral Reserve Board (U. S. A.)	...	"	11'0
Gold remittances	...	"	2'0
Additional takkavi loans	...	"	1'4
Total	...	"	141'3
War loan receipts	...	£. m.	37'1
Receipt of purchased silver	...	"	56'3
Revenue surplus	...	"	13'0
P. C. R. investment	...	"	24'7
Reverse Councils	...	"	4'8
Reduction of balance	...	"	5'4
Total	...	"	141'3

This was the position of the Government of India. The same transactions were a little different as far as the Secretary of State was concerned, and are represented by the subjoined table:—

Transactions of the India office in 1918-19.

Councils receipts	...	...	£. m.	20·9
Recoveries from H. H.'s Treasury	...	...	"	86·3
Special recoveries	...	...	"	13·1
P. O. and M. O. receipts	...	...	"	4·3
Reduction of balances	...	...	"	3·1
Total	...	...	"	131·3

Ordinary Home Charges	...	...	£. m.	22·9
Silver payments	...	...	"	44·0
Second Indian War Loan	...	...	"	33·4
British Treasury Bills (investment)	...	...	"	20·7
Sterling transfers	...	...	"	5·4
Discharge of Indian debt	...	...	"	1·8
Miscellaneous	...	...	"	3·1
Total	...	...	"	131·3

WAR AND THE MECHANISM OF THE INDIAN CURRENCY SYSTEM.

Thus, then, the Government of India had, during the greater part of the War period, to face an entirely new situation. In spite of heavy, almost lavish investments in the English War securities by the Government of India, the balance in favour of India could not all be destroyed. The gold, which, in years immediately preceding the War, was becoming more and more acceptable to India for settling the trade balance due to her, was, under war conditions, impossible to obtain, belligerents and neutrals guarding and adding to their gold Reserves with an uncanny jealousy. The only alternatives open to the Government of India were: to coin new rupees, to add to the note circulation, and, when both these were used to the utmost limits of prudence or good faith, to raise the exchange value of the rupee. Between April, 1915,

and the end of the last financial year, 1918-19, according to the Finance Minister, nearly 120 crores of new rupees were put into circulation. The note circulation, which was, about Rs. 68 crores on 31st March, 1914, was according to the latest figures available, over 166 crores. The rate of Exchange was raised, first in the beginning of 1917 to 1/5d, to 1/6d in April 1918, to 1/8d in May, 1919, and at last to 1/10 on the 11th August, 1919. There are apprehensions in well-informed circles that, in view of the rise in the price of silver, and considering that the latest rise was made even before the Currency Committee had presented its report, Exchange might even be put up to 2s. in the near future.

In spite of the concurrent application of all these remedies the situation has by no means improved. The Committee recently appointed to consider the whole question and to advise upon it, indicates the gravity of the situation, at the same time that it affords an opportunity fundamentally to reconsider the entire Currency organization of India. The subjoined table gives in a concise form all the important factors of the situation as they prevailed in the War years; and, judging from recent events, it does not seem that they have altered in any appreciable degree as yet:—

(The figures are in crores of rupees except in the last two columns.)

Year	Exports	Imports	Excess	Councils	H. Charges	Gold Import	Silver Import	Rec. Ex.	Rs. coined
1909-10 ...	187'96	122'65	65'31	40'54	29'68	21'67	9'44	In million sterling.	217,56,166
10-11 ...	209'96	133'70	76'25	40'02	29'37	23'98	8'63		219,25,112
11-12 ...	227'99	144'45	83'93	40'83	28'93	37'76	5'33		2,80,74,320
12-13 ...	246'21	166'63	79'58	38'50	30'42	34'00	17'20		19,53,69,944
13-14 ...	249'00	191'30	57'70	46'59	30'46	23'32	13'03		13,15,68,537
14-15 ...	182'17	144'93	37'24	11'68	30'31	7'64	8'87	18'6	2,17,95,336
15-16 ...	199'48	138'17	61'31	30'36	30'16	—1'10	4'83		1,62,02,109
16-17 ...	243'04	160'23	82'81	49'04	31'72	13'23	18'80	38'5	30,77,07,327
17-18 ...	244'89	164'35	80'53	51'28	39'10	25'17	19'04	65'00	23,15,69,657
*18-19 ...	255'27	188'56	66'71	31'35	...	...	...	76'0	...

* [These figures are from the April issue of the *Capital*; the others from the statistics of the Government of India.]

By a comparison of these figures it will be seen that :—

(a) While in the quinquennial before the War the net excess of exports of merchandise on private account amounted to Rs. 362,79 crores, during the War quinquennial the excess on the same account was Rs. 328,62 crores; If we include the transactions of the Government the net excess in the former period was 391 crores, and in the latter 381 crores.

(b) The net imports of Gold on private account during the first period was Rs. 144 crores and of silver Rs. 36 crores or a total import of precious metals of Rs. 180 crores. Against these in the following five years the total imports of precious metals were Rs. 55 crores. The gold imports almost entirely fell off, the total for the period being Rs. 39 crores, of which 18 crores

were acquired by the Government, leaving only 21 crores for private absorption. Hence the demand for silver, hence the heavy purchase of silver by the Government of India, the rise in the price of the silver, and, finally, the rise in the rate of Exchange.

(c) The recoverable expenditure of over £200 more than set off the Home Charges amounting to about £100 million and facilitated considerable investments in British securities.

III. THE REMEDIES SO FAR TRIED BY THE GOVERNMENT OF INDIA.

We have deliberately left out in this brief review of measures adopted by the Government of India those restrictions on trade finance which were tolerated only on the excuse of the supreme necessity of finishing the fight successfully. They were, besides, in their nature nothing but palliatives which may lull the patient to sleep, but cannot cure him of his malady. Thus War-time

restrictions on financial facilities to exporters from India by requiring the Banks to curtail their accommodation except to those dealing under Government license or those able to provide full cover, would, in normal times, have been resented by the Bankers, who could have easily rendered such restrictions ridiculous. And even in War-time the Banks were bound by no law to respect these wishes of the Executive, except for fear that on default they might be cut off from such share of the Council Bills as would otherwise fall to the lot of complacent banks. But though the banks did, to some extent, carry out this policy of restricted finance, it is doubtful if it was really helpful in reducing the strain. Similarly, prohibition of certain classes of exports, though restricting trade in those articles, did not affect the excess in value of the exports over the imports, and consequently can scarcely be described as a successful expedient in saving the Exchange situation. The only remedy of this description, which may at all be said to have been successful, was the Gold Import Acts. The forcible acquisition by the Government of all imports of treasure on private account, coupled, later on, with restrictions on the export of rupees or silver bullion from India, deserved a better fate, and might have been more successful if it had been applied earlier. The object of these measures was to prevent speculative purchases of the precious metals; and, by centralising their supply in the hands of the Government to provide an abundant supply as far as the demand was a genuine trade demand. Unfortunately the measures were adopted at a time when the crisis had already become tensely acute. The influence of the speculative element was by no means confined to the India market. The world at large had agreed to a tacit conspiracy to withhold gold from India. The Government of India were known to be considerable purchaser of silver. There was, therefore, no reason why the shrewd Yankee should not make a profit as much from his

silver resources, as from the other supplies he offered to the belligerents. It is quite true that the Government of the U. S. A. since 1917 offered to co-operate with the Government of India in keeping the price of silver within bounds; but those bounds came to be fixed at a time when the price of silver had already broken its records for the last thirty years or more. Consequently, in fixing the price the two Governments had necessarily to consider existing conditions, and not the conditions which obtained before the War. The American restrictions on the price of silver, moreover, were imposed only for the duration of the War; and, so soon as the War was definitely over those restrictions were removed, with the result that we in India are suffering from a most acute silver shortage in the first year of peace. Our two last rises in Exchange have taken place too closely on the heels of the removal of American restrictions not to raise a reasonable suspicion that the market had been kept in check by the co-operation of the American and Indian Governments, and that the moment that co-operation was withdrawn the actual situation had asserted itself

Taking seriatim the three principal remedies of the Government of India coining more rupees, adding to the note circulation, and raising Exchange,—the first had definite limits put to it not only by the scarcity of supply and the consequent rise in price of the material, but also by the undesirability of adding too much to the circulation. In his interesting Report on the rise in Prices in India, Mr. Datta gives the following table showing the growth in the circulating medium and its effect on prices.

Growth in Currency notes and Rupees in active circulation.

		Circulation crores	Index. No.
1884	...	115	88
1885	...	118	90
1886	...	117	90
1887	...	116	89
1888	...	118	90
1889	...	123	94
1890	...	120	92
1891	...	131	100
1892	...	141	108
1893	...	132	101
1894	...	129	99
1895	...	132	101
1896	...	127	97
1897	...	125	96
1898	...	122	93
1899	...	131	100
1900	...	134	103
1901	...	150	115
1902	...	143	109
1903	...	147	113
1904	...	152	116
1905	...	164	126
1906	...	185	142
1907	...	190	145
1908	...	181	139
1909	...	198	152
1910	...	199	152
1911	...	209	160
1912	...	214	164

He concludes, however: "This increase in the volume of metallic currency does not, however, appear to have been larger than what has been required by the growth of business and other demands for currency." But since his report there have been added to the circulation about 150 crores of rupees newly coined, of which 120 crores were estimated to have been minted during the War years, and about thirty crores fresh coinage during the three years before the War; about 100 crores in round figures to notes in circulation; and a certain amount of gold coins, about

£40 million worth of sovereigns *1 in all. Against the estimated total circulation of 214 crores of rupees and notes, in 1912 as reported by Mr. Datta, we shall be guilty of no over estimate if we put the total Currency resources of India at the present moment at 550 crores in all, of which rupees would account for at least 300 crores, notes for another 166 crores, and gold coins £80 million †2. Mr.

*1 In the table appended Mr. Datta has not included the number of sovereigns in circulation. We get the amount by the following table, compiled from the Report of the Controller of Currency.

Net addition of sovereigns in Public hands in million sterling.			
Year.			
1901—02	...	...	£m. '967
1902—03	...	...	" 2'198
1903—04	...	...	" 3'278
1904—05	...	...	" 2'937
1905—06	...	...	" 3'732
1906—07	...	...	" 5'156
1907—08	...	...	" 7'427
1908—09	...	...	" 3'443
1909—10	...	...	" 2'866
1910—11	...	...	" 8'091
1911—12	...	...	" 8'881
1912—13	...	...	" 11'300
1913—14	...	...	" 3,907
1914—15	...	...	" 5,623

We cannot get accurate statistics regarding the absorption of gold coins during the War years. But the figures given here, if totalled, would show a total gold absorption in the first fifteen years of the present century of close upon £70 million = Rs. 100 crores at the old rate. It may be that for purposes of circulation the gold coins thus shown to have been absorbed into India may be left out of account, since there is reason to believe they might be used for hoarding purposes. But it must be remembered that these are coins, as distinct from gold bullion imported in almost equal quantity during the same period, and that, therefore, the probability is not quite so strong for believing that they constitute almost wholly the hoards.

†2 The estimates of existing circulation are based on the figures of notes and rupees said to have been coined or added during the period under review. It may be that now that the rupee is almost as valuable as coin as it is as metal there may have set in a greater tendency for melting or exporting it than was the case in the early years of the century. But the measures adopted by the Government rather incline us to hold that the tendency, if any, must have been checked almost at its inception, except for that portion of the export of rupees, unknown to the public, for which the Government itself must be responsible in connection with the Mesopotamia campaign.

Datta, in the table appended, found the rise in the Index numbers of nearly the same proportion as the rise in the volume of circulation, varying from year to year also in very nearly a direct ratio. He, nevertheless, as shown by the quotation, does not quite consider the increase in circulation as being responsible for the rise in prices, the increased circulation being, in his opinion, necessary by the expanding needs of the business. Even admitting his position, there is no reason to believe that corresponding to the increase in the circulating medium during the War years there has been a similar expansion in the volume of business. The total amount of foreign trade for example, as can be seen from the table given elsewhere, was not much greater in the War years than in the previous years. And, if anything, the Banking facilities during the War have been much increased, as shown by the opening of new banks, as well as the more extensive use of credit documents. Against the 585'82 crores worth of cheques in 1913-14; which was the largest pre-war number, there were 851'15 crores of cheques cleared in 1915'18 in the four clearing Houses of Bombay, Calcutta, Karachi and Madras. The Capital and Reserves, the Public and Private Deposits, all tell the same tale of increase. We cannot but conclude that this increase in the medium of circulation has an undesirable effect on the price-level.

The problem of financing the trade balance in favour of India, if dependance is placed exclusively on the coinage of new rupees, is bound to be unpleasantly complicated in the near future, and for some time to come. The world-production of silver is falling off as shown by the figures below, at a time when the world's demand for silver is rising to previously unthinkable proportions. The Government of India have been the most considerable buyers in the World-market and if that demand continues there will be no hope of reducing the price of silver, assuming that it is capable of reduction. The Government of India are in the unfortunate position of tying up their own hands in advance, by tacitly promising to convert the local into the International currency

and *vice versa*. It will be no real solution of the problem to suggest the maintenance of the Exchange value by a reduction in the weight of the rupee. Not only would it be a breach of faith, which might be tolerated if the emergency was so desperate; it would introduce the most unwelcome confusion in the credit relations of private parties as well as the Government. The experiment, if tried, must face a not unreasoning distrust of the public as well as the possible containing on a much larger scale of melting operations. If we assume that there are at least 300 crores of rupees in circulation, of which one-half may be melted down by such a temptation, the Government would have to face a serious demand for rupees without improving their position in exchange very considerably. Their demand for silver, even to coin a debased coin, would keep up the world price against them. It is, indeed, possible that the supply may be added to by such melting. But as far as the Government are concerned, if there be any truth in the legend about the hoarding propensities of the Indian people, there would be no relaxation of the strain.

World Silver Production.

Year	Million Oz.
1907	184'2
1908	204'2
1909	202'1
1910	222'0
1911	224'3
1912	216'3
1913	214'5
1914	213'6
1915	193'9
1916	177'4

The alternative of adding to the paper money in circulation is no better. As it is, the amount of paper in circulation, judging from previous experience, is beyond all reasonable requirements, even allowing liberally for the increased popularity of notes on account of greater familiarity forced by the War. The increase is not brought about by the natural process of normal expansion of credit and

the consequent supercession of cheaper for more costly forms of circulating media, but by the reckless additions in times and on account of the necessities of War. As against the slightly more than 20 per cent of the total currency issued against securities in the period immediately preceding the War, there is now nearly 70 per cent of the total circulation issued against such securities. And the bulk of these securities held in England are beyond the control of the Government of India, should they show a tendency to depreciate. The paper money, therefore, instead of offering a reliable, sound, solution for the present problem, constitutes itself one of the gravest problems of Indian Financial organization. Further additions to its uncovered portion cannot be contemplated unless inconvertibility is accepted as an ordinary correction of unfavourable exchange.

The rise in the exchange was the last remedy open to the Government of India to meet the growing balance of trade in favour of India, or at least to curtail it to manageable proportions. The Government were, indeed, aware of the gravity of such a step as much as their critics, if we are to judge from the too evident reluctance with which the responsible Finance Ministers resolved upon the step. It was in manifest opposition to the declared policy of the Government, if not in contravention of their solemn obligations, always to afford ready facilities for the conversion of rupees into gold and vice versa. There can be no dispute that the rise in Exchange would hurt the prospects of the export trade. The attempt was, indeed, made at first to justify the measure as a war necessity. But it was too painfully palpable that even when the war would be over there was no immediate prospect of restoring the old level of Exchange. It could be said, with some justification during the War, that the rise in exchange was not really materially a hardship to the Indian exporter, as his goods would be demanded no matter what

the price. There was no effective competition, and the demand was almost unlimited so long as the supplier was willing to accept promises to pay in exchange for goods supplied. But now that the War is over, now that the trade restrictions against the erstwhile enemy countries have been removed, or are in process of removal; now that those countries, spurred on by the double incentive of defeat and indemnity, are likely to engage and be encouraged in the trade of the world with all the intensity that five years exclusion from the world markets could lend, all the advantage that a low exchange could afford, all the facilities that accumulated stocks of easily marketable commodities can supply; there is every reason to apprehend now that the trade of India would be most gravely prejudiced by these continued rises in Exchange.

There is an excuse for the Government of India in that the high exchange supplies them with abundant funds cheaply in England, enabling them to pay off their Home Charges at a much reduced cost in rupees. This is an argument entitled to respect from every financier interested in the stability of the finances of the Government of India. But before the argument can claim to be unanswerable, it must be observed that the saving to the Government, even if admitted, is not necessarily a saving to the community. Unless the money thus saved is returned in one form or another to the community, either by remission of taxation or by undertaking works of material benefit, there would be no occasion to plead this saving to the Government as a reason to excuse the rise in Exchange. If we are to judge from the last Budget,—the first Peace Budget of the Government of India, there seems no immediate prospect of either remission of taxation or undertaking of projects of moral or material welfare of the country in the near future. It may be that the war had ended but too recently when the last Budget was presented to allow us to judge from it of the course of

future financial policy; though it will be indisputable that for the next generation or so the effects of this war will be felt very severely in finance. Even admitting the saving to the Government it must be remembered that while on an average the Home Charges amount to £ 20 million, on which the saving at £ 1 = Rs. 10 would be Rs. 10 crores, the loss to the trade on a total export trade of £ 200 million would be Rs. 100 crores. The saving to the Government would have to be very considerable, or would have to be most beneficially laid out, if it is to be regarded as an effective counterpoise for this loss. Finally, the argument from Government interest in the matter should not be pressed too much. If the constitutional reforms promised during the War are accomplished in times of peace in the spirit in which they were promised, the influence of the Home Charges ought to be a steadily diminishing factor. If the important posts in the civil and military administration of the Government of India are held in increasing proportions by the children of the soil; if the greater portion of the public debt of India is held by Indians in this country; if the expansion of Indian industries supplies all the civil and military stores wanted by the Government of India, the chief items of the Home Charges would begin to be unimportant,—at any rate they would not be sufficient to set off such a considerable loss to the producer as to make that factor entirely disregarded.

The rise in Exchange, we may take it then, entails a loss on the Indian producer without a corresponding benefit to the Government. In the near future the argument now frequently heard, that the rise in prices far greater than the adverse exchange would make the exporter's interest automatically safe-guarded, cannot be sustained. The World Price-level may, indeed, be maintained for some time by Labour organization or by State control. But if, as is probable, in the principal countries of Europe Labour

consciousness succeeds in getting control of the Industry, it would be more in harmony with the Labour programme to reduce the profiteer's tax, than to maintain a high level of prices. The latter would be a burden on the consumer whose ranks are made of a very large proportion of the labouring population in every community. The device of reducing the output to maintain the prices is a Capitalist threat, which, the intelligent labour organizations of to-day will easily see, is inconsistent with the national or even the Labour interests. And all that labour need in justice claim would be obtained by eliminating the private profiteer and his tax on labour or on the community in the shape of high prices. Government control of industry if it does not restrain the selfish capitalist instinct, will fare poorly in the face of awakened consciousness of economic slavery of the rest of the community to the private industrialist. Besides, it would not quite be correct to assume that a high level of prices will be maintained for a considerable period after the War is over. The nations of the world who have been engaged in the struggle are all debtors enough to need to encourage by every means in their power exports. Germany, for one, if it is to pay the promised indemnity, must not only be not excluded from the trade of the world, but will find a large balance of exports as her only solution. The tales we hear of accumulated stocks of marketable commodities in Germany are enough to indicate the effect on the World Price-level if dumping on a large scale takes place. In any case India is not yet so completely freed from the character and needs of a debtor country as to make its Government indifferent to the interests of the exporter.

The only remaining plea that we need glance at in passing is: should the rise in Exchange discourage exports the Indian producer will find a compensation in the greater development of the Home market. The War-time activity in industrial development,

the pronouncement of Government in favour of rapid industrial expansion, and the ease of getting capital makes many people sanguine as to the future of industry in India. But the process, to be accomplished so completely as to absorb all the produce of India in the demands of India, must take time. If we are to judge from War-time phenomenon it may be said to have set in; and if the Government of India adopt a change of front and heartily take up the policy of encouragement and aid to Indian industries there may be hopes of a brighter future in that respect. But even if the goal of industrial development is accomplished and India's industrial ambitions are realised, the net result would be a change in the character of exports. Instead of raw materials being the principal item of exports, there would then be exported the monopolies of India or her manufactures. The interests of the exporter will continue to demand public attention so long as the principle of nationality is an accepted politico-economic axiom.

The only sound, permanent solution, then, that we can think of after a review of all the factors bearing on the situation is the adoption of the Gold Standard and a Gold Currency. The root of the whole trouble was the refusal of the commercial world to let India have her share of the Gold of the world during the last five years. While the gold reserves of other countries have increased during the War to the extent of the marginally noted amounts India got less than one-fifth of her usual share. The Gold Exchange Standard sound perfect in theory; but it must be admitted to have lamentably broken down in practice. The Government of India cannot fix an artificial value for the standard local coin, promise to maintain it at that figure against all contingencies, and then, at the first reverse in the bargain, try to back out of the transaction altogether. We would not say that the breach of faith involved in the recent putting up of the Exchange was deliberate; but any body can see

it is disastrous. In gold using countries, moreover, the present paper standard has put up the price of gold beyond its legally fixed volume; and the gold producer may well threaten the reduction of output if remunerative returns are impossible. But in India the price of bar gold at Rs. 33½ per tola works out at Rs. 89 per oz. by no means prejudicial to the gold producer. If left free to settle her trade balance in the customary manner India would obtain sufficient gold to keep a stable exchange without the artificial meddling with that factor by the Government more frequently influenced by fiscal than by trade considerations. Gold in circulation, moreover, would not only relieve the pressure on silver rupees it would remove the present ominous preponderance in the paper circulation, un-supported by an equivalent or even a safe metallic Reserve. The apprehension is felt in some quarters that gold in circulation would be inaccessible in times of panic for the settlement of international obligations. Judging from the habits of the people it may be predicted that a certain proportion of gold would be so absorbed as to be unavailable for Currency purposes, though it must be observed that the course pursued with respect to that metal, during a period when it was really a commodity and not a medium of exchange legally established and commercially used, will not be a good indication for judging of a similar tendency when it is made legal tender standard money of the country. A large proportion, however, of the gold coins must remain in circulation and be accessible in times of international financial difficulties. If it is not so the reason would be the restricted use of bank-paper. This is, indeed, the gravest of the defects of Indian currency and financial organization the absence of up-to-date, flexible banking facilities. With a well developed system of banking the huge Government balances would not remain for ever closed to trade. With a well organized system of banking, adopting metal saving devices like the Giro system of payments of the Reich Bank of Germany, the fears of inaccessible hoards of gold will practically be groundless. And, if the note-issue is handed over to such a central State Bank as alone can claim and maintain the dominion of the Indian Money market, the

use of cheaper forms of currency will be very much encouraged. With a rupee of varying value, the paper based on it will always share in the distrust aroused by the variation in the value of the principal. The conversion of the notes in terms of the gold Standard, and provision for immediate convertibility in gold will add to the popularity of the notes merely increasing their circulation. And, if in re-organizing the Currency system, the expedients they have adopted in the United States Federal Reserve Notes are introduced, we would have a reserve for notes which could with the greatest facility be converted into the form of commercial credit or Government credit as occasion may require; at the same time that the principle of immediate convertibility and equivalent Reserve are fully maintained.

The marginally noted amounts referred to in the previous page are:—

U. S. A.	... £.m.	250
Spain	... "	70
Netherlands	... "	43
Switzerland	... "	10
Scandinavia	... "	40

It is of course, true that the changes here advocated, the adoption of the Gold Standard with Gold Currency, the re-organization of the Note system and the reform of Banking in India, will take time. But the moment when the Indian Exchange Committee is investigating the whole system will not be badly chosen to suggest such fundamental reforms. The plea may indeed be urged that if adopted the reforms would become impossible owing to the sheer inability to obtain Gold at present. The simple answer to that plea is that India has sufficient amounts owing to her in gold (Rs. 82 crores in the Paper Currency Reserve and Rs. 30 crores in the Gold Standard Reserve) to justify the claim of these suggestions to be practical unless we assume tacitly the bankruptcy of our debtors. If it be found that the debtors must have time to return their loans, the course may be adopted of issuing Bonds of a definite limited currency, specifically secured on the outstanding credits of India in the gold-using countries, and thereon the Currency reform may be undertaken in both its branches, metallic money and Paper. Short of this radical remedy, we fear all other tinkering with the system will only end in making the problem perennial, in upsetting trade and industry in India, in gravely prejudicing the interests of the Indian producer.

THE INCOME-TAX IN OTHER COUNTRIES.

BY R. K. SANGAMESWARAN, MA., L.T.

THE recent proposal of the Government of Mysore to levy an income-tax ought to be still fresh in the mind of every one. At a time like this it may not be out of place to briefly consider the nature of the income-tax and see how it is levied in other countries. A tax that is resorted to by every one of the most advanced and progressive countries has in itself a strong recommendation for its adoption in this State; but yet it would not be unprofitable if we examine its place in the public finance of other countries and learn how to utilise it most profitably in our own.

All the levies made by a State can be divided into two broad classes. In the first class there is a direct exchange of services between the State and the contributor, as for instance in the fees levied by the post, telegraph or registration offices; while in the second class, the contributor who pays a levy to the State does it without expecting any services directly in return, as for instance in the land tax. This latter class of payments made by the subjects of a state, characterised by a compulsion and by the absence of any direct service in return is called a tax. The total amount of the taxes collected is the public revenue, which is utilised in the public services for the common good, such as the maintenance of roads, the police, the army, etc.

Taxes are of different kinds. From the earliest times taxes on land and real property have been the mainstay of all governments in every part of the world. With the extension of trade and commerce and the development of industries, customs, excise and other duties contributed a fair share of the public revenue. These are called indirect taxes, for the reason that they are collected indirectly

by methods of which we are 'but dimly conscious'. As civilisation advanced and the sphere of public activity of progressive governments widened, the public expenditure also rapidly increased, and with it the necessity arose for increased revenue by new taxation. The increase in national wealth, and the extensive application of machinery in production rendered possible a field for fresh incomes and therefore, an opportunity for fresh taxation. Thus slowly came into existence, new taxes like the income, inheritance and general property taxes. These taxes have been called direct taxes for the reason that they are collected directly from every person possessing the income or the property.

Questions of justice and equity arise, especially in direct taxation. Is it just to levy an income-tax on all persons from the common labourer to the millionaire? Again, if all have to pay, are they to pay equally, or in proportion to their incomes or more than in proportion? It is considered a great social injustice if the poor man is taxed directly for he has hardly "the means of subsistence." Therefore, in all countries it is now the universal practice to levy the income-tax only upon the comparatively well-to-do classes, all persons having incomes below a certain sum being exempted. Thus it is that incomes below £160 are exempted in England (1898 Reg.); incomes below Rs. 2,000 in British India (1918 Reg.); incomes below 900 marks in Germany.

The fixing of the minimum may be looked at from another standpoint. Apart from the universal discontent and heart burning that would result in case the income-tax reaches very small incomes, any government would find it ruinously expensive "to collect from millions of working men a few dollars or shillings each."

The income-tax was not brought into existence in any country, with the avowed intention of taxing the rich. In most cases it was first resorted to as a temporary measure to

meet a financial emergency, although later on it became an indispensable feature of the fiscal system. In England, for example, the income-tax was imposed for the first time by Pitt in the year 1798, when an addition to the State revenue was an imperative necessity. When it assumed its present form in 1803, it was tacitly understood to be a temporary measure. It lapsed in the year 1816, when the period of financial stress was over after the great continental wars. After an interval of twenty-six years, it was again revived as a temporary measure in 1842 and has had an uninterrupted existence ever since. At present it is one of the most important features of the British fiscal system; but yet, curiously enough, the stump of temporariness still continues as it is renewed annually.

By the act of 1898, incomes below £160 are exempted in England. Some idea of the productivity of the tax, at the beginning of this century, could be had from the fact that in 1899 each penny of the tax was estimated to yield £2,248,000. The rate of incidence varied from year to year the average being about 8*d.* in the pound. In 1874-76 it went down so low as 2*d.* in the pound and in 1855 rose as high as 16*d.* in the pound. In this century, again, it was 16*d.* in the pound during South African War (1902), while at the outbreak of the great European War (1914) the rate was enhanced to 2/6 in the pound. Another feature of the British income-tax system is the abatement on income between £160 and £700, *i.e.*, the full rate of tax is levied only on incomes above £700. Further the rate of abatement was made to depend on the nature of the income in 1907. In 1910, the principle of progression was also established by a 'super-tax.'

While the income-tax occupies a prominent place in the public finance of a prosperous industrial country like England, in a poor country like India it is conspicuous by its poor yield. In the year 1913-14, the revenue derived from the tax was £1,950,250 out of a total revenue of £85,207,175.

At its inception, in 1886, and during its revision in 1916, the difficulty and opposition met with from the public was considerable. For those that would be subjected to the tax are fairly rich and belong to the commercial or upper classes, and, therefore, capable of sufficient influence in resisting the imposition of the tax for one reason or another. In the words of Sir John Strachey,* "there is no country where a tax upon incomes is more just than in India, but there has been difficulty in imposing and maintaining it because it has been opposed by the richest and most powerful classes, who alone can make the voices heard."

The tax in its present form was first levied in the year 1886,† all incomes below Rs. 500 being exempted. The minimum of income assessable was, however, raised to Rs. 1,000 in the prosperous days of 1903, by Lord Curzon. During the great war, the Government of India, being hard pressed for money, introduced (in 1916-17) the principle of progression, as well as a super-tax on all incomes above Rs. 50,000. These changes were expected to yield £6,313,200, out of a total revenue of £108,346,900, in the budget for 1918-19. For reasons not quite apparent the assessable minimum was raised to Rs. 2,000 last year.

Progression seems to be the order of the day in direct taxation. For income and inheritance taxes, some scale of progression or other has been adopted in all countries. This device seems to be in harmony with popular sentiments and appears to have been adopted as a set off to the great inequalities in wealth, so characteristic of society in modern times. The spirit of 'democracy' and 'equality' is satisfied a little if recourse is had to the principle of graduation in direct taxation. The following tables illustrate the scale of progression in Income and Inheritance taxes in other countries:—

*India: Its Administration and Progress.

† Before that year there existed a 'license tax' on industries and professions.

I. Income-tax.

1. United States (1913).

Amount.		Tax.
From \$ 4,000 ...	up to \$ 20,000 ...	1 per cent.
20,000 ...	50,000 ...	2 ..
50,000 ...	75,000 ...	3 ..
75,000 ...	100,000 ...	4 ..
100,000 ...	250,000 ...	5 ..
250,000 ...	500,000 ...	6 ..
500,000 ...	...	7 ..

2. British India (1916-17).

Amount.		Tax.
Rs. 1,000 ...	up to Rs. 2,000 ...	4 pies in Re.
2,000 ...	5,000 ...	5 ..
5,000 ...	10,000 ...	6 ..
10,000 ...	25,000 ...	9 ..
25,000 ...	...	1 anna ..

Super-tax.

50,000 ...	up to 1 lakh ...	1 anna ..
1 lakh ...	1½ ..	1½ ..
1½ ..	2 ..	2 ..
2½ ..	...	3 ..

II. Inheritance Taxes (Examples of Progression.)

1. English Estate Duty (1894).

Amount.		Tax.
From £ 100 ...	up to £ 500 ...	1 per cent.
500 ...	1,000 ...	2 ..
1,000 ...	10,000 ...	3 ..
10,000 ...	25,000 ...	4 ..
25,000 ...	50,000 ...	4½ ..
50,000 ...	75,000 ...	5 ..
75,000 ...	100,000 ...	5½ ..
100,000 ...	150,000 ...	6 ..
150,000 ...	250,000 ...	6½ ..
250,000 ...	500,000 ...	7 ..
500,000 ...	1,000,000 ...	7½ ..
	over 1,000,000 ...	8 ..

2. French Inheritance tax (1901).

(Direct line.)

Amount.		Tax.
From Fr. 1 ...	up to Frs. 2,000 ...	1 per cent.
2,001 ...	10,000 ...	1.25 ..
10,001 ...	50,000 ...	1.50 ..
50,001 ...	100,000 ...	1.75 ..
100,001 ...	250,000 ...	2.00 ..
250,001 ...	500,000 ...	2.50 ..
500,001 ...	upwards ...	2.50 ..

[From the table of Solomon Herebner, N. Y.]

In any tax system the criterion of a good tax lies in the comparative ease and efficiency with which it can be collected. In the case

of the income-tax there are two modes of collection. It may be collected directly from the persons whose incomes are above the taxable minimum. This direct method is in vogue in continental countries including Germany, where a trained class of officials do the difficult and often the delicate work of ascertaining each individual's income by declarations, often assisted in each locality by persons of position and influence, 'who are in the know.' From the very mode of collection it is obvious that this system is readily adaptable to progression.

Another method known as the 'stoppage at the source' is practised largely in England and British India. In this case the tax on the income of a person is not collected from the individual directly, but is deducted from his income before it reaches him. For instance, the income of a company as a whole, is taxed, and when the dividends are distributed to the shareholders each of them gets his amount diminished proportionately. The same thing is done by Government when it pays interest on the national debt or salaries to its servants, and by banks while forwarding foreign remittances to its customers. Thus three-fourths of the British Income-tax is collected "without a word of enquiry or a possibility of evasion", the only exceptions being the earnings of lawyers, physicians and the like, where a direct collection by declaration is resorted to. The great advantage of this system lies in the fact that the tax is collected efficiently by a comparatively inexpensive machinery. It is, however, not easily adapted for progression, as a man's total income is not declared, since the tax is collected severally by stoppage at the sources. "Notwithstanding the administrative advantages thus secured by refraining from the attempt at progression, the British income-tax has been remodelled in very recent years precisely in the direction of progression"* (see p. 4).

* Taussig: Economics, Vol. II.

The income-tax occupies a unique place in the annual budget of certain countries. On account of the facility with which the tax can be increased or diminished, without trouble or change in the machinery of collection, it is of immense practical advantage in the hands of a skilful finance minister. Not only does it afford a ready means of realising additional revenue in times of national emergency, but it is also specially adopted for the adjustment of public income and expenditure from year to year. In this respect the skilfulness with which the British income-tax has been manipulated deserves attention; as we have seen the rate varies with the need of the year (see p. 4) and the readiness with which an increased revenue has often been secured by enhancing the rate, is a clear proof of the flexible nature of the tax.

In poor, backward countries like India or the Native States, the income-tax cannot play this role, as it is neither rich in its yield nor adjustable from year to year without great opposition. But yet it would be wise to keep the tax as elastic as possible, by imposing it in such a way that the tax would not be felt as a burden; so that it is capable of a ready increase in times of emergency, like famine and war.

From a study of the nature and mode of administration of the income-tax in other countries, it must now be evident that a tax of this kind in this State ought not to meet with any opposition. The poor and middle classes are already taxed enough and should, therefore, not be burdened further to contribute to the increasing public expenditure, as a result of the extension of public activities in newer and ever widening spheres, such as, education, sanitation and the promotion of 'all art and the higher interests of life'. In this glorious duty of the government it is but right that "the classes of the country who derive the greatest security and benefit from the government"* should contribute their share of the public burden.

* Sir A. Colvin.

Nor is this State unique in extending the sphere of public activity in newer channels. It appears to be a world movement; for as Professor Wagner* puts it—"Comparisons between different countries and different periods show regularly among progressive nations an extension of public activities. This manifests itself extensively and intensively. The State and its subordinate political units continually undertake new functions and they perform their duties, old and new, better and better. In this way, that is through public agency, the needs of the population to an increasing extent, especially their common needs, are satisfied; and the public services for the satisfaction of needs continually improve in quality. The clear proof of this is given statistically in the increased demands made by the State and the subordinate political units."

The formation of an American Foreign Trade Corporation, with a capital of £1,000,000 for Trade and Commerce with the Near East is an event of considerable importance, for it indicates very clearly the intentions of America with regard to the trade enterprise in that part of the world.

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Wood block paving which in European cities has long been the favourite, is increasing in use in Canada, despite the frequent clumsy methods used by Town Engineers in laying it. Rightly laid it is an ideal paving material.

* He calls it the "Law of Increasing Public Expenditure". On this interesting topic R. Ely's *Evolution of Public Expenditure* may be consulted.

THE STANDARD OF LIVING IN INDIA: ITS INFLUENCE ON PRODUCTION.

K. KUNHIKANNAN, M.A.

THERE is hardly a subject about which there is greater misconception in the popular mind than the standard of living in India and its influence on production. The accepted theory in regard to the interaction of these two factors becomes inverted, when it is applied to India. Opinion is inclined to the view that the vast resources in India remain for the most part undeveloped largely because the average level of consumption is so low and recently William Archer has gone so far as to declare that for India to be in a line with the Progressive countries of the West she has 'to learn to want more wants.'

This view may pass for acceptance unchallenged. It is easy to assume that the environment in India has affected adversely the health and strength, the character and energy, of her people. Nature has been too prodigal in her gifts and life lived mostly in the open and without the discipline of a winter, has been too easy to develop the more virile virtues, which exist only, where the task set to man is heavy and exacting. The ideals and institutions of the people are pointed out as reflecting many of these depressing influences. There are tenets in Indian philosophy, which may be brought forward in support of the theory that in their struggle with the environment, Indians have lost far more than they have gained and that they have gradually been forced to reduce their wants to the level of their limited energies.

The argument is plausible but cannot stand close examination. Those who accept this line of reasoning forget that Indian Industries and Commerce were flourishing for several centuries and that stagnation set

in only so late as the eighteenth century. There is no reason to believe that the people who for so long as fifteen centuries resisted the enervating influences of nature, suddenly succumbed to her viles, spoiled by her gifts, and lulled to her langours. As for the depressing influence of Indian philosophy, even if we accept it, as a correct description of what is in many respects one of the most remarkable achievements of human thought, it should suffice to point out that for all the spiritual elevation of the Sermon on the Mount, Christian Europe has remained distinctly material in aid and endeavour.

It is equally absurd to argue that in India human wants are few and easily gratified without much exertion. The fifty millions, who are said to be on the verge of starvation even in normal years, live on 'their one meal a day, not certainly from choice. In their case the want has all the intensity of a privation but nevertheless fails to rouse them to the exertion necessary to add to their scanty subsistence. India has certainly wants enough without learning 'to want more wants.'

We are led to these absurdities because the symptom is mistaken for the disease. The standard of living in all countries, does little more than reflect the productive effort of the people. It is causal in so far as it may in its turn influence production and in India it can be shown that it has less influence in this respect than in other countries. The primary factor everywhere is production. When men produce on a large scale the increasing wealth soon manifests itself in a rising standard of living. When production is low the standard deteriorates. It does not, however, follow that when the standard of life rises production necessarily keeps pace with it. The British workman has had a very fair share of prosperity during the last few years and his period of work has been reduced to forty-eight hours a week. There has been nevertheless a considerable

falling off in the output of British manufactures which if it continues may tell heavily against England. Production depends then not so much on the standard of living. It depends rather on the proper adjustment of effort and opportunity. Where one is weakened by physical and moral prostration, the other restricted or denied and both dislocated from their natural and healthy relation, the argument of tropical sluggishness ceases to be convincing.

The environment has its influence on the Indians. Their needs are less urgent. The shelter from wind and weather is simpler in character. But the reaction of this comparative simplicity of Indian life, on productive effort, has been to a large extent prevented by the customs and institutions of the people. If we grant, as we must, the force of inherited aptitudes and the influence of surroundings, on the individual under the caste system, it must be admitted too that, to the extent of these influences, the productivity of the various castes was rendered independent of their standards of life. We have evidence of that independance in the survival of the handloom and the devotion of the weaver to it, in spite of the fierce competition and the abject deterioration in his condition. So too with the joint family. There are those who see in it nothing but ruin and disaster for India. A great deal of the condemnation appears perhaps deserved when it is seen amidst the disintegrating influences at work to-day. But rightly viewed, in the social order appropriate to it, the obligation of support and helpfulness on a large circle of relations which it imposed on the individual under spiritual sanctions, sharpened the appetite for work which is said to get weak under the stress of the tropical heat. If it is found to-day to make far too many dependants on the successful member of the family, it is because the opportunities of suitable employment are few or do not exist. In any case there are not people wanting even now who but for the restraint

of a large circle of relatives and dependants, would exchange their productive activities for the inanities of the sack cloth and begging bowl.

The joint family made for a more equitable distribution of wealth. Under it the contrasts of wealth so common in the individualist societies of the West were not possible. On the other hand, the poor were more secure from starvation and neglect.

The standard of living in India is low, not so much because of the enervating climate, of a depressing philosophy or of 'status-fostered indolence,' but because there have been forces in operation, historical, political, and economical, over which Indians have had very little control. The political confusion in India right up to the nineteenth century was not calculated to stimulate production. Yet her industries and trade were saved from dislocation largely by the caste organization. Her prosperity was still at a high level when Europeans appeared in India. With the peace that settled over the country after the conquest by the English, the productive activity of the people should have increased. On the other hand, it received a serious set-back. Many of her trades and industries were ruined or killed by a series of tolls and tariffs which gave undue preference to English goods. The Industrial Revolution hastened and free trade completed the process.

The decay and ruin of Indian industries compelled large sections of the population supported by them to resort to agriculture. To the same profession flocked the disbanded soldiery, whose services were no longer required by Indian States, now prevented from mutual wars by the supreme power. Under the security of life and property now assured, the people began to multiply, to further increase the ranks of the agriculturists. The rapidly increasing pressure on land was not perceived until large tracts of abandoned or virgin soil were brought under the plough. This stage was not reached for some time,

but when it was, the consequences of this wholly one-sided development of Indian production became visible in the rapid fragmentation and attention of holdings which are universally admitted to be serious obstacles to agricultural improvements.

There were other factors to depress agriculture. The total volume of agricultural produce indeed increased considerably but the yield per acre tended rather to decrease. The conservation of forests involved restrictions on the facilities of grazing and of obtaining firewood enjoyed by the ryot population from time immemorial, which affected the agricultural stock by diminishing the food supply and necessitated the conversion into fuel of a great part of the cowdung hitherto used as manure alone. A third influence at work was the disorganization of credit. The prosperity of agriculture had in the main depended on the richer landlords who helped their poorer neighbours with loans of money and seeds. The tendency of the joint family system to favour the growth of a peasant proprietary at the expense of large landowners had to a large extent been checked under Indian Princes by their throwing on the country a continuous supply of retired officers both civil and military provided with properties which descended by the law of primogeniture. The new rulers looked upon these men who supported the agriculture and industries in their neighbourhood and who wielded no small influence, with suspicion and distrust. The law of entail was not recognised in regard to their estates which were consequently broken up and brought soon to the level of riotwari properties. The disappearance of this nobility and gentry led to an increasing dependance on money-lenders whose exactions received the support of British courts to an extent seldom allowed by Indian Rulers.

Nor were the revenue arrangements made in the early years of the nineteenth century calculated to further the progress of agriculture. The new rulers of the country mistook the assessment they saw levied by Indian Rajahs under the exceptional conditions of political confusion, for the normal

share they could permanently claim. In thus regulating their taxes with reference to an abnormal standard they invariably imposed an assessment too heavy for the ryot with the additional disadvantage of a rigidity which taxes never had under indigenous rule. The first experiment in land settlements proved ruinous to royts all over India. To give but one example under the first settlement in Bellary out of 2,644 villages no less than 1,800 reverted to British hands for arrears of Revenue. These initial mistakes have since been largely rectified.

As indicating the direction of the forces at work the results of the investigation of a Deccan village by Dr. Mann and his assistants are of very great interest.

About the progressive decrease in the size of holdings they write as follows: "It is evident from this that in the last sixty or seventy years the character of the land-holdings has altogether changed. In the pre-British days and in the early days of British rule the holdings were usually of a fair size most frequently nine or ten acres while individual holdings less than two acres were hardly known. Now the number of holdings is more than doubled and 81 per cent of these holdings are under ten acres in size, while no less than 60 per cent are less than five acres. The economic condition of the village is described as 'disheartening'. The debts are a crushing load on the people but even were they removed more than half the families (228 people) would still not be able to pay their way, counting personal expenditure at their own standard (Rs. 4-8-0 per adult male per month). And this is the case when outside employment was particularly active, when no less than 30 per cent of the population were employed at fairly good rates at Kirkhee."

Pimpla Soudagar is a typical village of the Deccan, not of all India. It is cited here to indicate not the effect but the direction of the forces at work. Even were the conditions generally in Indian villages only half as bad as they are in Pimpla, we have a very serious state of affairs sufficient to account for the deficiencies in the quality and quantity of Indian production. But productive effort is adversely effected not alone by defective nutrition. The lowered vitality resulting from it paves the way for diseases. In one of the appendixes of the report of the Industrial Commission

stress is laid on this important factor. The toll levied by malaria reaches several millions annually. The anaemia that follows it in those that survive the disease does not make for efficiency. The hook-worm which in some villages in South India and in Bengal is said to effect cent per cent of the population produces the same disastrous effect. Much of the differences between the Northern and Southern inhabitants in the United States as regards productive efficiency was for a long time attributed to the proximity to the Tropics of the latter but has now been definitely traced to hook-worm. So too has the efficiency of the Philippines increased with the gradual stamping out of the nematode. It is equally certain that a similar campaign against it in India would give equally encouraging results.

But were all these factors removed, Indian efficiency would still be at a lower level than in the West. Productive effort is at its maximum in a competitive stage of society, where the market is to those alone who utilize in the best way possible the resources of science and machinery. But in agricultural pursuits especially on the small and scattered holdings of India the personal factor is not so important, as there is little of the stress of competition to induce men to work under high pressure. And when it is remembered that 70 per cent of the population are engaged in rural occupations and a large proportion of the labour found in town is drawn from them, the comparative inefficiency of Indian labour becomes apparent. There can be no doubt, however, that with the advance of India to a competitive stage, Indian efficiency would improve.

The standard of living in India appears then not to have been fixed by her climate, her philosophy or her religion. Rather it has reached the present low level as a result of a gradually increasing deficiency in Indian wealth brought about by narrowing down her activities to the one branch of Agricultural production and by allowing the growth even in that limited field, of serious obstacles which have unsettled the connection between industry and reward. With the provision of suitable facilities and the removal of these obstacles Indian production is bound to increase in volume and the greater wealth will soon become manifest in a higher standard of living.

MYSORE ECONOMICS—III

Agriculture—Facilities for Transport of Labour, etc.

BY K. SUBBA RAO, B.A.

ONE of the most urgent requirements of the State is the provision of adequate facilities for the easy transport of agricultural labour, perishable produce, implements and seeds, and manure (oil cakes, etc.) from one part of the country to another. The difficulties which exist at present are truly formidable and they act as a great deterrent. I shall illustrate it by reference to actual facts. Some years ago I had gone to Hiriyur for ascertaining the agricultural prospects of the lands under the Vanivilas Sagara (Marikaneve Channels). Some of the enterprising ryots who had migrated there all the way from the fertile District of Trichinopoly, asked me how they could find a market for fruits and vegetables; especially plantains which on the day they were there, they had plenty to export and how they could transport labour from abroad easily. The distance from the Railway is prohibitive. In almost every District and especially in the Chitaldrug, Kadur and also in the Mysore Districts, similar tracts may be found. There is plenty of land to cultivate. But where is the labour to come from? and if produce is abundant, how are arrangements to be made for immediate transport to stations where they are sure to find a ready sale? The bullock cart is no doubt invaluable and even in the War it has played an important part. But for agricultural improvement of a permanent character, along with the bullock carts, there should be also speedier means of locomotion.

Some years ago Diwan Bahadur Mr. J. S. Chakravarti had drawn up a scheme in connection with the Conference for the introduction of motor transport in all the Districts of

the State where such transport is urgently needed. But somehow the scheme was dropped. We have to revive it without loss of time if the total output has to be increased.

Railways naturally take time for construction. The cost of iron and other materials has increased so greatly and there is so much unrest in Europe in almost every trade, that there does not seem to be any reasonable prospect of Railway construction at the pre-war rates in the near future. The Government have on hand already railway projects and their completion is likely to take several years. Further extensions would well-nigh take us to very long periods from now. Agricultural progress in Mysore cannot surely wait indefinitely till all the Districts are covered thoroughly with railway lines in active work.

While following without laxity the Railway policy on hand, the country has to be opened up immediately in all parts by a bold utilization at once of motor vehicles both for transport of men and agricultural produce,—especially the perishable ones, and seeds and implements and of food products like milk, ghee, butter, vegetables, fruits,—etc., in all parts not affected by the Railway. It is necessary to grant by legislation a monopoly of traffic for some years to Companies or Syndicates willing to provide efficient cars and to fix fees on a scale approved by Government. The roads should also be maintained in a condition fit for motor traffic by the Public Works Department, the Local Fund Boards and the Municipalities concerned. Motor syndicates are as great benefactors to the public as Railway Companies and are entitled to as many concessions as the Railway Companies enjoy. These will disappear as soon as they are displaced by Railways. At the commencement even interest up to some limit may be guaranteed. The subsidy thus paid would be more than compensated by the increase of agricultural

produce, the migration of more agricultural labour and the higher profits which ryots will get by readily selling their perishable products and by getting at less cost and in less time the articles they require from the capital cities of the State. In America even private owners of land of ordinary dimensions carry out their ploughing, sowing, harvesting and marketing operations through their own motor vehicles. In some parts of the world the State lays the Railway lines, marks the fields, builds houses and then settles labour and capital on the land by giving large advances as working capital. Is it then too much to ask for the establishment of public motor service at no cost to the Government except a few concessions and sympathetic guidance.

Motor syndicates need not necessarily mean foreign syndicates. If a statement of policy is announced, then capitalists within the State with the co-operation and active association of the motor companies in Bangalore, Bombay and Madras, may be able to supply the necessary cars for passenger and goods traffic and arrange the details as effectively as for transport by railway.

The *Malnad* and the *Maidan* Districts will both benefit immensely by the scheme and in the case of the *Malnad*, even the payment of a moderate subsidy to the Motor Companies, would result in speedy agricultural prosperity and the *Malnad* improvement schemes of all descriptions would be more fruitful of good results than at present. In these days of air ships, it is not possible to expect any appreciable improvement in agriculture if up-to-date facilities for transport of the necessary labour and produce is not sufficiently supplied.

Unless more capital is invested in land and more labour is employed, it is not possible to get the maximum quantity of crops from lands at present under cultivation and to bring under cultivation new lands. Labour has to be imported from one part of the

State to another and also from abroad from the neighbouring Districts of the Madras and Bombay Presidencies whenever possible. Capitalists from abroad have also to be invited to take up lands if the area under cultivation has to be appreciably increased. The increase of area under cultivation and settlement of labour will in the long run add to our population which has been seriously affected by Influenza and Plague. But the want of speedy transport within the State is now a great hindrance and until it is removed, progress is bound to be phenomenally slow.

I therefore assign to this subject the very first place in the programme intended for increasing the total output of agricultural produce in the State.

At the first General Meeting of the Bombay Central Co-operative Institute held on the 23rd Aug. 1919, the first Report for the period ending 31st March 1919, was read. The report covers a period of six months only—from 2nd October 1918. Much of this time was spent in spade work. The brunt of all the initial work was borne by Mr. R. B. Ewbank, I.C.S., the Registrar. The Hon. Lalubhai Samaldas is the elected Vice-President of the Institute, and H. E. Sir George Lloyd has kindly accepted the Presidentship. To carry on the work of the Institute in its different departments, the following Special Committees exist:—Committee of Secretaries Training Classes; (2) Committee for Night Classes and other Social Work, (3) Co-operative Housing Committee; (4) Committee of Co-operative Quarterly; (5) Committee of Co-operative Study, Propaganda and Inquiry; (6) Organization Committee; and (7) Committee for other Co-operative Work. From the brief account of the work done by the different Committees, it is evident that the work of the Institute is yet in the stage of commencement, and its accomplishment depends much on the whole-hearted support of workers in all the different parts of the Presidency. The Institute has requested Government to make an annual grant of Rs. 4,000, and it is hoped that Government will see their way to sanction the amount.

THE STORY OF THE CANADIAN PAPER INDUSTRY.

BY THE EDITOR.

WHILE we are talking of a paper industry in the Mysore State, the people of Canada have developed their paper industry to an extent which is striking to a degree. It is impossible to overestimate the importance of developing our paper industry on sound lines. We have an abundance of raw material in the State in bamboo, straw, cotton stalks, soft woods, waste paper, etc. The question of the utilization of bamboo for paper has received considerable attention in recent years. The practicability of extracting of good writing paper from it has been demonstrated by experts and the possibility of the manufacture of strawboards from paddy straw has also been fairly thrashed out. What is required is the spirit to look at the question from a business point of view. The market conditions now are such that the manufacture of paper in Mysore would be facilitated to an extent undreamt of in the years gone by. The organization required for turning what is now really running to waste into a useful manufactured article may be put together without undue difficulty if the people of the State look at the question from a broad business point of view. The need for taking greater interest in the matter will be better understood when we state that British paper manufacturers are turning to the bamboo as a cheap and dependable raw material for their future supplies. More than that they are taking up land in bamboo areas and even planting up the same with bamboo to future needs. In India and Burma steps are being taken to utilize bamboo extensively in paper production. With these facts before us, we cannot afford to leave the question of a paper industry in Mysore for an indefinite length of time.

The story of the progress of the Canadian paper and pulp industry as unfolded in a recent report issued in the Census of Industry Series by the Canadian Bureau of Statistics is of such absorbing interest that we give below the main portions relating, with a view to stimulate the interest of people in the State interested in industrial matters. The report shows the immense development that has taken place during the four years of the War, 1915-1918. If the report helps our people to realize even dimly the possibilities of an industry of a similar kind in Mysore, it will not have been referred to in vain by us in these pages.

The report, as we have said above, shows a considerable growth when the statistics in the present report are compared with those of 1915. In 1915 the number of active mills was 80, and the value of production \$40,348,001. In 1917 there were 83 mills in operation, with a production of \$96,340,327, an increase in the latter year of nearly 140 per cent, as shown in the report. Another important measure of growth, according to the report, is found in the consumption of pulpwood, which in 1915 was 1,405,836 and in 1917 was 2,104,334 cords, or an increase of nearly 50 per cent during the same period. The total cut of pulpwood was 2,355,550 cords in 1915 and 3,122,188 cords in 1917, exports of pulpwood having risen from 949,714 cords in 1915, to 1,017,854 cords in 1917. The production of wood-pulp in Canada in 1917 in all classes of mills amounted to 1,464,308 tons, compared with 1,296,084 tons in 1916, and 1,074,805 tons in 1915. Of the 1917 product, 804,472 tons were used by the producing mills in the manufacture of paper, while 659,836 tons were made for sale. The amount received for pulp sold was \$ 32,824,626, or an average price per ton for all classes of pulp of \$49.75. The average value of the different kinds of pulp made for sale was \$28.06 for ground wood, \$72.31 for sulphite fibre, and \$68.26 for sulphate fibre. The export price of

mechanical or ground wood pulp in 1917 was \$ 28.32, and of chemical pulp, \$ 73.01. The value of the entire output of wood pulp, if calculated at the average price per ton realized for that portion which was sold, would be \$ 72,849,323.

The consumption of pulpwood in all mills making pulp, whether purchased or cut from own limits, was 2,104,334 cords, of the value of \$ 18,817,483 in 1917, as compared with 1,764,912 cords, valued at \$ 13,104,458, in 1916, and 1,405,836 cords, valued at \$ 9,426,217, in 1915, or an increase of 688,498 cords, or nearly 49.7 per cent in the two-year period. The average price per cord was \$ 6.71 in 1915, \$ 7.42 in 1916, and \$ 8.94 in 1917, an increase of \$ 2.23 per cord, or nearly 33.2 per cent in the two years.

The order of importance of the five provinces remained the same as in 1916, Quebec leading with 1,109,869 cords, or over half the total. Ontario was second with 735,691 cords, or over a third of the total. British Columbia was third with 134,814 cords, New Brunswick fourth with 105,586 cords, and Nova Scotia last with 18,374 cords. The quantity of pulpwood consumed in each province is an increase in every case, as is the average value per cord of wood.

Spruce continues to lead all classes of wood, being 79.7 per cent of the total in 1917, balsam fir and hemlock being next in order of importance. These three woods all show increases from 1916. Poplar and pine show decreases from the preceding year, and tamarack and cedar are reported from British Columbia for the first time in several years.

The greatest proportion of the wood used still goes into the manufacture of ground woodpulp, although the three chemical processes are making heavier demands on the wood supply each year. In 1915, 52.9 per cent of the wood was used in making ground woodpulp. In 1916 this proportion decreased to 46.9 per cent and a further

decrease to 45.8 per cent is recorded for 1917. The increase in the proportion of wood used for the manufacture of chemical pulp does not represent an equal increase in the production of pulp by these methods. Where over a ton of pulp per cord of wood is produced on the average by the mechanical process, only 1,105 pounds are produced by the sulphate process, 1,063 by the sulphite process, and only 930 pounds by the soda process.

The mechanical process does not demand the use of the most expensive grades of wood, and the average value, \$ 8.07 per cord, is therefore the lowest on the list. Certain species, such as jack pine, which cannot be used to advantage in other processes, are useful in making kraft pulp, and the average value of wood used in the sulphate process, \$ 8.10 per cord, is also low. The best quality of pulpwood goes into the manufacture of sulphite at \$ 10.18, and soda pulp at \$ 10.07 per cord.

For the mechanical process the highest average number of pounds of pulp produced per cord of wood was 2,305 in British Columbia, and the lowest 1,818 in Nova Scotia, the average for the Dominion being 2,043 pounds per cord. By the sulphite process in the manufacture of paper the highest average, 1,137 pounds, is again found in British Columbia, and lowest, 961 pounds, in Ontario, the average for the Dominion being 1,063 pounds. The sulphate process shows highest in Ontario with 1,176 pounds and lowest in Quebec with 1,063 pounds, the average for the Dominion being 1,105 pounds. The soda process shows the lowest production, *viz.*, 930 pounds per cord.

The quantity and value of pulp used in the manufacture of paper, whether produced or purchased, includes ground wood 617,029 tons, with a cost valuation of \$ 9,984,597; sulphite fibre, 239,129 tons, valued at \$ 10,613,617; sulphate fibre, 28,822 tons, valued at \$ 1,773,029; and soda fibre, 6,001 tons, of a value of \$ 448,746. The value of

other materials used, such as rags, old or waste paper, alum, etc., was \$ 5,797,445. The total cost of all materials used was \$ 28,617,434.

The report shows a total capital investment of \$ 186,787,405, of which \$ 84,609,584 was in Quebec, \$ 72,006,972 in Ontario, and \$ 22,584,652 in British Columbia. Land and buildings represent an investment of \$ 84,461,837, machinery of \$ 59,266,596, whilst working capital was \$ 15,156,506. Over 76 per cent of the total investment is in the class of combined mills, 19 per cent in mills producing pulp only, and nearly 5 per cent in mills making paper only. Each province shows an increase in capital over 1915 except Nova Scotia, where the decrease amounted to \$ 199,030. British Columbia's capital investment rose from \$ 8,344,416 in 1915 to \$ 22,584,652 in 1917; New Brunswick from \$ 3,927,858 to \$ 7,136,277; Ontario from \$ 57,173,623 to \$ 72,006,972, and Quebec from \$ 63,641,956 to \$ 84,609,584. The average total capital invested in pulp mills was \$ 1,057,610; in pulp and paper mills, \$ 6,192,365; and in paper mills, \$ 323,241. The total yearly capacity of mills making ground wood-pulp in the

Dominion was 1,088,431 tons, dry weight, of which Quebec's equipment represented 601,436 tons or 55.2 per cent. Ontario represented 357,250 tons, or 32.8 per cent followed by British Columbia with 100,600 tons, or 9.2 per cent. New Brunswick with 21,145 tons, or 19 per cent and Nova Scotia with 8,000 tons or less than one per cent. The actual output of ground woodpulp in 1917 was 923,731 tons.

The quantities and values of the different kinds of paper products are shown by the following table:

	Tons.	Value.
Newsprint paper ...	689,847	\$ 38,868,084
Book and writing paper ...	48,141	9,310,138
Wrapping paper ...	50,360	5,646,750
Boards ...	54,080	3,543,164
Other paper products ...	11,261	1,487,122
All other products (value only).		3,438,107

The average value per ton for each group was as follows: Newsprint, \$ 56.35; book and writing papers, \$ 193.40; wrapping paper, \$ 112.12; boards, \$ 65.50; and other paper products, \$ 132.06.

Capital investment in pulp and paper mills for the years mentioned are summarized in the report as follows:

	1915.	1917.	Increase.
Land, buildings and fixtures	\$ 74,383,608	\$ 84,461,837	\$ 10,078,229
Machinery and tools	31,856,265	59,266,596	27,410,331
Materials on hand, stocks in process, etc. ...	17,254,317	27,902,466	10,648,149
Cash, trading and operating accounts, etc. ...	10,242,613	15,156,506	4,913,893
Totals ...	\$ 133,736,803	\$ 186,787,405	\$ 53,050,602

The total quantity of wood pulp exported in 1917 was 511,803 tons, of the value of \$ 26,129,906, of which 250,043 tons, valued at \$ 7,082,206 was mechanical, and 261,760 tons, valued at \$ 19,110,700, was chemical pulp. There was a decided falling off in the exports of mechanical pulp, amounting to 79,709 tons, though the value shows an increase of \$ 1,432,841. On the other hand, there was a marked increase in the export

of chemical pulp, amounting to 32,613 tons, and a correspondingly marked increase in the value amounting to \$ 7,415,823. More than 92.5 per cent of the quantity and 88 per cent of the value of all pulp was exported to the United States. The average value per ton for all kinds of pulp exported was \$ 51.17 in 1917, as compared with \$ 31.03 in 1916, and \$ 25.48 in 1915. Mechanical pulp rose from \$ 15.67 per ton in 1915 to \$ 17.13

in 1916, and \$28.32 in 1917. Chemical pulp, which was 38.36 per ton in 1915, rose to \$51.04 in 1916, and \$73.01 in 1917.

No pulpwood is imported into Canada.

The total value of paper imported increased from \$2,402,557 in 1915 to \$4,204,968 in 1917. The total value of paper exported in 1915 was \$18,430,013, while the total value exported in 1917 was \$35,774,636. That is, our imports of paper in 1917 increased in value over those of 1915 by \$1,802,411, or by 75 per cent while our exports of paper in the same period increased by \$17,344,623, or by 94.1 per cent.

To summarize in a few words the Canadian paper and pulp industry has gone up by leaps and bounds within the past four years. There were in 1917, 83 mills working; the value of their produce had increased to nearly 96½ million dollars, or by nearly 140 per cent. The consumption of wood pulp increased in the year to over 2 million cords, or nearly 50 per cent more than what it was in 1915. Exports of pulp wood rose from nearly 950,000 cords in 1915, to a little over a million cords in 1917. In 1917 the capital invested in the production of paper pulp was about 186¾ million dollars, being 40 per cent more than in 1915. This sum was made up as follows: lands, buildings and fixtures, 84½ million dollars; machinery and tools, 59¼ million dollars; materials in hand with stocks partly converted into pulp, nearly 28 million dollars; while the balance was made up of cash, trading and other accounts. Here are certainly some figures to ponder. If development is necessary, people must more largely come forward to organize and work to success industrial enterprizes of this kind.

MICA MINES IN NELLORE.*

BY G. H. TIPPER,

Assistant Superintendent, Geological Survey of India.

THE main formation of the country examined is a complex of garnetiferous hornblende and biotite schists, generally finely foliated. Sufficient felspar is often present to cause these rocks to resemble crushed gneisses. More massive hornblende rocks (amphibolites) are well developed in the western part of the district but they cannot be separated from the schist complex. On a large scale this complex is strikingly uniform in character but the intimate geology reveals an extraordinary variety, each band differing in texture and mineralogical composition. The following variations have been noted: epidote schists and gneisses, chlorite schists, potstones, schists with kyanite and crushed quartz bands. The general strike of the schist complex is from north to south with a prevailing westerly dip. The strike varies from place to place and swings through an angle of 90°, from north-west—south-east to north-east—south-west. Individual bands in the schist traced over any distance invariably show a wavy strike. The angle of dip is also variable but is generally high.

Rising from the almost flat plain of schist are a number of hogbacked hillocks. These hillocks form the most conspicuous feature of the landscape and are composed of lenticles of crushed and sheared quartz. West of the village of Lingampalle is a ridge consisting of a number of these quartzite lenses in which bands of the beautiful fuchsite quartzite occur. These quartzites seem to be igneous in origin and intrusive in character.

*From a report submitted to the Director, Indian Geological Survey, and published by the Government of Madras.

THE PEGMATITES.

The pegmatites in which payable mica occurs are intrusive into the schist complex. No instance has yet been seen where they are intrusive into the quartzites although there are several instances where they occur in the mixed rock on the edges of the quartzite masses. The pegmatites are conformable in strike and dip to the rocks into which they have been intruded and no case has yet been noted where they cut across the strike of the enclosing rocks. As might be expected from this conformability, the pegmatites show variations in strike and dip similar to those of the schists. The commonest form of these intrusive masses is that of a lens, a series of connected lenses, lenses arranged en echelon, or long irregular masses. Contrary to what is customary in other parts of India the larger masses tend to be much coarser in grain than the smaller. The central regular quartz core which is so common in the Bihar pegmatites is here often very irregularly developed. In many cases it seems that a massive development of a mixed rock of quartz and felspar takes its place. Some instances of the effects of pressure are seen but usually the crystallisation has taken place under perfectly quiescent conditions and the mica in this area has on the whole been less subject to distortion than in other areas. Many instances have been seen where the schists have been disturbed by the pegmatitic intrusion.

DISTRIBUTION OF PAYABLE MICA
IN THE PEGMATITES.

The irregularities of form of the pegmatites already noted will naturally affect the distribution of payable mica. Unfortunately the prevalent custom of opencasting all deposits, the lack of records of work done and the state of most of the pits in many cases prevent inferences being drawn from the workings. There are one or two points to which attention may be directed. No pegmatite contains payable mica uniformly developed

throughout its mass. There is always a barren portion more or less central. The information gathered lends itself to the conclusion that the contact sections near the hanging and foot walls carry the better mica. In these huge masses, however, the contact sections may easily be of considerable thickness and it may be expected that the contact mica is irregularly distributed through this breadth. Judging from the old and present workings at Tellabodu this is the case in the hanging wall section there. Each pegmatite will vary in this respect. There will also be variations in the value of the mica content and in certain cases it may well be that no mica of marketable size will be present. Subsidiary runs of mica may also occur.

SURFACE INDICATIONS OF PEGMATITES.

The country being almost uniformly flat and soilcovered, good exposures are naturally rare. A little consideration will show that, if any portion of the pegmatite does outcrop, it will be the harder and more resistant parts only, either quartz or the massive quartz felspar mixture rock and in these mica cannot be immediately expected. These indications such as they are should be of the greatest value to the prospector. Even in those localities where there are no outcrops but where the presence of hidden pegmatites is suspected, the resistant portion of the pegmatite will be nearer the actual surface. The situation of many pits close to irrigation tanks is not fortuitous but is due to the prospecting work done during the excavation for the tank and the bund. The amount of mica often to be seen just below the soil-cap is astonishing. Judging from its condition and mode of occurrence this mica has been weathered out *in situ* or almost *in situ* and had not travelled any distance.

PRESENT METHODS OF PROSPECTING
AND MINING.

Leaving out of account those properties which have passed into competent European management, there is one method of prospecting and mining universally in use in

the district. A number of small holes are dug in a likely place and any which give a good show of surface mica are continued, being enlarged to enable the coolies to work easily. If mica continues in the pit the work is continued, the hole being enlarged more and more until it eventually becomes a fairly large open pit from which water cannot be excluded. As the waste rock is dumped on the lip of the hole, each enlargement necessitates the re-handling of a large amount of material already raised to the surface. Each rains, the pit is flooded and partly filled with mud, causing a still further uncalled for outlay. This briefly is the history of every pit now to be seen in the district. The life of such a pit is short, depending on the value of the deposit, the stability of the walls, the depth of water level, and the presence of large waste heaps on the edge of the pit. In other words further work is stopped by the difficulty of moving large heaps of waste material or the value of the deposit does not warrant the continuance of opencasting. Throughout no attempt is made to investigate the pegmatite as a whole, to find its limits either in length or breadth. Even in places where surface outcrops show a connexion between pits no attempt is made to open them up. Labour is very wastefully used. Simple labour-saving devices are practically unknown. An important point with regard to opencasting is that, in addition to allowing free entry to surface water greatly aggravated by the spongelike dump heaps on the lip of the hole, cutting through the schist and particularly through the junction of the schist and the pegmatite opens up water channels through which water continues to percolate long after surface water has ceased. With a little intelligent forethought in preliminary prospecting and laying out the work in proper branches to allow of the proper utilisation of labour and explosives even the present system of work could be greatly improved. In the proper use of explosives

the lack of efficient supervision is very apparent. The shot holes are short and badly placed, while only half a dynamite cartridge is used. The following description of . . . mine will give some idea of the final condition of a comparatively large pit after it has been opencast. The pit has been excavated to get mica from a single, well-defined pegmatite lens. The strike is north-east to south-west and the dip is practically vertical. The approximate dimensions of the pit are : length 450 feet, breadth 200 and depth from 150 to 180 feet. At the bottom of the pit there are from 70 to 100 feet of water. The lens has been completely excavated to a depth of about 40 feet and below that chiefly on the footwall and only partly on the hanging wall. The waste rock is now heaped up on the immediate lip of the hole. It is probably the latter which has prevented the continuation of the pit. The amount of rock excavated is in the neighbourhood of 3 million cubic feet and cheap as labour is it would not pay to re-handle this mass of material. This 3 million cubic feet includes all the schist which had to be cut away to make the walls safe ; this is probably 500,000 cubic feet. The amount of barren pegmatite also raised to the surface is probably one million cubic feet. The actual mica-bearing rock is thus reduced to only a million and a half cubic feet. In any other system of mining except opencasting the latter figure represents the total amount of rock which need have been raised to the surface.

The objections to opencasting may therefore be summed as follows :—

- (a) it permits the free entry of surface water ;
- (b) it opens up the principal drainage channels in the schists and at the junction of the pegmatite and the schist ;
- (c) It is wasteful in labour ;
- (d) The disposal of the dump is a matter of considerable difficulty ;

- (e) It is impossible with this system of mining to carry on operations to any depth. Even under the most favourable conditions open-casting in this district has not produced a mine deeper than 180 feet, a mere scratch on the surface. The depth to which open-casting can be continued may be taken as equal to the breadth of the excavation. To carry on operations down to the shallow depth of 500 feet would entail a pit of at least 500 feet broad and so on in proportion. It is obviously impossible to do anything of the kind.

OPENCASTING MUST BE UNHESITATINGLY CONDEMNED.

The sole advantage of the method is that it is the simplest form of mining and can be carried on with the minimum of supervision which need not be highly trained. Most of the supervisors are very poorly paid and cannot be expected to superintend any but the most elementary work. All the work is done in the open air and a man standing on the edge of the pit can see everything that is being done.

TRENCHING FOR PROSPECTING PURPOSES.

The simplest and best way of prospecting is by means of trenches put down at right angles to the strike of the pegmatite. Trenches should be used even in places where there are outcrops, as in the majority of cases the outcrops will not show the full breadth of the pegmatite. For all practical purposes the strike may be assumed to be from north to south. Any difference from this direction will be revealed in the first trench and the others can be laid out accordingly. The trenches ought to be carried down to the fresh rock and from schist to schist across the strike. By this means all the necessary information as to length of strike

and breadth of the pegmatite can be obtained. Such preliminary work should give valuable indications of the distribution of the payable mica in the pegmatite. The work can be done just as cheaply as by putting down a number of shallow pits. In many cases the cost will be recovered from the value of surface mica won. If the latter is spread over any considerable area it can best be won by trenching and filling in behind and not by a large open pit.

OPENING UP OLD PITS.

As neither plans nor sections of any of the old workings have ever been made, accurate information as to the extent and plan of the workings is unobtainable. Inquiries from coolies and others who at one time worked there will not elicit anything more satisfactory than a statement of the depth expressed in length of palmyra trees. The mere inspection of any old working will not enable a definite plan to be formulated although useful suggestions can often be made. Before a definite plan can be laid out for opening up it is essential that old pits and workings should be dewatered and cleaned. From what has been said above it seems that this requires a considerable outlay of capital. Pumps must be installed and some form of mechanical haulage. The old workings must be bottomed before a proper plan can be laid out. The information to be expected from this cleaning will include any signs of impoverishment of the mica content, the relative position of the workings in the pegmatite, the safety or otherwise of the workings, the possibility of utilizing the work already done in the new scheme and above all the prevention of serious disaster which might result if the old workings were neglected and were suddenly cut into.

As an instance of the capital necessary for such operations the mine referred to above may be taken. The cost of opening up and cleaning this pit cannot be put at a lower figure than Rs. 50,000 and it may be much

more. It may be pointed out that on account of the form of the pegmatite this is a more speculative venture than usual.

The reluctance of the Indian mine-owner and lessee to open up and spend money on old pits from which he himself has had a good return leads to the conclusion that this type of work will be left to European firms employing trained mining engineers, who are willing to risk their money and are able to draw up proper plans for development. The Indian miner will remain content to continue making open pits down to comparatively shallow depths from which an easy return may be expected.

CONTINUATION IN DEPTH OF THE MICA-BEARING ROCKS.

As all the pits are mere scratches on the surface (the deepest being only 180 feet) nothing definite is known of the behaviour of the pegmatites or of their mica content at any great depth. The marked lenticularity and irregularity of outcrop of many of the deposits lead to the conclusion that similar irregularities will occur at depth. Deposits with lenticular outcrop will be solid lenses in form. Whether these will actually pinch or merely thin and make again cannot be predicted. Even in these variations must be expected. Instances of this pinching out of lenses are well established in the Kodarma area, Bihar. The opening up of a large single lens such as the mine referred to above will be of great interest in this connexion. Large masses with long strikes may reasonably be expected to persist to some depth. In fact nothing is definitely known of the behaviour of pegmatites at any but the shallowest depths, very largely due to the wasteful methods of mining in vogue.

OPENING UP NEW DEPOSITS.

No hard and fast rule can be laid down for the actual opening up of new deposits. Each pegmatite has its own peculiarities and much depends on the results of the preliminary prospecting work. The actual development

work of the mine is best confined to the pegmatite itself and no attempt should be made (unless in very exceptional circumstances) to do any development in the country rock. In the majority of cases the pegmatites are sufficiently strong to stand without artificial support if the work is properly laid out.

MINE EQUIPMENT AT PRESENT IN USE.

Many of the pits are equipped to deal with an inflow of surface water. Oil engines and centrifugal pumps are in common use. With a fixed suction and throw, these are efficient but where, as in mining, the throw is constantly varying and lowering of pumps is necessary, they are clumsy and wasteful, involving the use of counter-shafting entailing a great loss of power. Electrically-driven pumps were installed at Sankara and were in process of installation at Kalichedu. They require skilled workmen to look after them and are not sufficiently 'fool-proof' to be recommended. The best and most efficient from all points of view are those worked by steam. The difficulty in this case is fuel. Coal is prohibitive in price and fuel obtained from the local forest coupes is poor. Possibly a solution may be obtained by adapting boilers to use oil fuel.

Mechanical haulage is by no means common. Generally waste rock is raised by hand.

Rock drills are in use at Kalichedu and Lakshminarayan mines and will be installed at Tellabodu as soon as it is possible to get them from Europe or America.

FUTURE OF THE DISTRICT AS A MICA PRODUCER.

The prospecting work now going on in the district points definitely to a large supply of mica still untouched. There is also a large amount still to be won from the many abandoned pits which await opening up. There does not seem to be any danger of an immediate cessation of the supply. The future of the field is, however, intimately connected

with the mining methods at present in use. If these wasteful methods are persisted in, the future of the field is a comparatively short one so far as the Indian miner is concerned, as there are no signs of his willingness to invest even a part of his returns obtained from mica in his own mines. Mica has been and still is looked upon as an easy way of getting a quick return from a very small outlay. This view is undoubtedly based on the meteoric career of the late Ansur Subba Nayudu. The Indian miner will be content to work over areas as large as he can obtain in shallow open workings. The mining future seems to remain then with the European firms who are at present at work in the field. They alone have the necessary trained staff and are willing to venture their capital in opening old pits. There are many indications that their influence is rapidly increasing in the field.

There is one way in which the Indian miners might avail themselves of an expert supervising staff and that is by co-operation. It is not every mica mine which is sufficiently valuable or big enough to warrant the whole-time services of a trained mining engineer. There could, however, be formed centralised groups of mines, each group to be placed under one man who would be responsible for the development, the expenses being shared amongst the lessees. The possibilities of co-operation do not end here but might be extended to include centralised cutting sheds and surface works. Even co-operative pumping is not out of the question.

COMMUNICATIONS.

In the Rapur taluk the mining district is very badly provided with roads. Within the triangle formed by the Rapur-Gudur, Rapur-Podalakur, and Podalakur-Gudur roads there are only unmetalled tracks. A road from the Podalakur-Nellore road at the Kondleru river crossing, was commenced. It passes the Kalichedu mines and ends in the air just north of Utukur village. It was constructed

by criminal tribes some years ago and has not since been repaired. It is of course impossible to arrange roads to serve every mine but there can be little doubt that well arranged roads form one of the best means of opening up mining districts. The chief needs seem to be (1) a bridge across the Saidapuram stream on the Gudur-Rapur road, (2) a metalled road on the line of the present track past Tellabodu, Pallamane, 'L.N,' 'F' mines, across to Kalichedu joining the Rapur-Podalakur road at the Kondleru river. This would open up a line of excellent mining country and would serve the greater part of the district south of the Kondleru river, all traffic north of the river going to Nellore.

The cost of handling heavy machinery on bad roads is excessive. A steam boiler was bought at Nellore for a sum of Rs. 3,000. To get it to the mine from Gudur Railway station, a distance of twelve miles, cost Rs. 2,000 or two-thirds of the value of the boiler.

According to the *Board of Trade Journal*, a tract of 25,000 acres is to be utilised in Florida for the purpose of planting and exploiting sisal on a commercial basis. We have much lee-way to make in Mysore, despite Government's encouragement in the matter.

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The Director of Industries, Assam, reports that he has had some enquiries for tea-seed oil, and he will be glad to put sellers in communication with the buyers. Tea-seed oil is used in China for cooking purposes, and it is also used in the production of hard white soap.

CALCUTTA UNIVERSITY COMMISSION.

SUMMARY OF RECOMMENDATIONS.

WE give below a summary of the recommendations of the Calcutta University Commission:—

SUMMARY OF THE REPORT.

The Report of the Calcutta University Commission is an analysis and criticism not only of the university system and the schools upon which it rests, but of the social and historical conditions which give rise to them, followed by a scheme of reconstruction. Its completeness has made the Report a lengthy document; the main Report runs to five octavo volumes (each averaging about 400 pages), and is followed by eight volumes of appendices, statistics and evidence. The Report is printed in an unusually convenient and attractive form, in handy octavo volumes and in large type; and the arrangement of the work is such that the reader should be able easily to find his way to the chapters and sections in which he is most interested. The evidence is arranged subject by subject so that the reader can review without difficulty the opinions of witnesses on matters in which he is particularly interested.

The first seven chapters give the historical and social background which is essential to an understanding of the problem. The Commissioners trace the growth of the Indian educational system and discuss the great landmarks in its development: 1813, when the Directors decided to spend at least a lakh of rupees annually upon education; 1835, when Government decided to maintain an absolute neutrality in religious matters and to devote most of the funds available for educational purposes to the maintenance of schools and colleges of western learning, to be taught through the medium of English; 1854, when Government created a properly

articulated system of education, from the primary school to the university, and adopted the affiliating system of university organization; 1882, when Government decided to withdraw as rapidly as possible from the direct control of secondary and collegiate institutions, except for the maintenance of a few models and, for expansion in these spheres, to trust and encourage private and local effort to the maximum extent, though on the mistaken assumption that schools and colleges wholly dependent upon the small fees which Bengal students could afford to pay would form a desirable solution of the problem; and 1904, when the Universities Act was passed. This chapter is followed by a special study of the policy of encouraging private effort in education, which has throughout been an outstanding feature of the policy of Government. Then comes a systematic and suggestive study of the psychology of the Bengali student, and of the interaction of his studies with his home life and his social traditions; an unusual contribution to an educational report, but one which should give real help in the comprehension of the problem. The special needs and difficulties of particular elements of the population (notably the Mohamedans) are then analyzed.

THE SCHOOL PROBLEM IN BENGAL.

After laying foundations of historical and social knowledge, the Report proceeds to investigate the actual working of the secondary schools, the objects and conduct of the matriculation examination and the recognition of schools. The deficiencies of the existing system arise, in the main, from four principal causes.—

- (a) Most of the high English schools are under-equipped and are conducted by an underpaid and for the most part an untrained staff.
- (b) They are unduly dominated by an examination (the matriculation) which is itself ill-designed and

not of sufficiently high standard, and which gives no encouragement to many lines of study necessary for the welfare of the pupils and for the prosperity of the country.

(c) Owing to the existing division of authority between the University and the Department of Public Instruction there is no adequate machinery for supervising, guiding and assisting the work of the schools as a whole; in other words a coherent system of secondary education does not yet exist.

(d) A large and vitally important part of secondary instruction is actually conducted, not by the schools but by the colleges of the University in their intermediate classes, and, because it is so conducted it largely fails of its purpose partly because the methods chiefly employed (those of the mass-lecture) are unsuitable for work at this stage, and partly because many subjects and lines of study, especially those which have a vocational bearing, are almost wholly disregarded.

THE ARTS COLLEGES.

The next chapters of the Report deal with the arts colleges, and with the remarkable development of post-graduate work which has taken place during the last few years. The defects of the system, to which the Commissioners refer, may be briefly summarized as follows :—

(a) The numbers are too great to be efficiently dealt with by a single university organization.

(b) The undergraduate courses of instruction in arts and science are given by colleges which are almost entirely self-contained and in many cases widely scattered,

and generally too meagrely staffed and equipped to be able to do justice to their students; some of them being wholly, and most of them mainly, dependent upon the fees paid by the students—a source of income wholly inadequate for the purpose. Even in Calcutta, where there are many colleges, there is no efficient co-operation.

(c) The courses of instruction are too predominantly literary in character, too little varied to suit various needs; nor is there adequate provision for training in technical subjects. At the same time, the methods of instruction are far too mechanical depending mainly on mass lectures, and giving a quite insufficient place to individual guidance and advice. This is due in part to the numbers which have to be dealt with in part to the influence of a bad tradition; but mainly to the fact the University is (in regard to undergraduate work) almost exclusively an examining body, external to the colleges.

(d) The great majority of the teachers are underpaid, and have no legal security of tenure and next to no freedom in their work, while most of them have no prospect of attaining to positions of dignity and importance such as would form a stimulus to good work.

(e) While the University has recently undertaken the direct control of almost the whole of the post-graduate work of the degrees of M.A. and M.Sc., and has brought about considerable improvement in this regard; there is, because of this division, an unhappy cleavage between the higher and

lower teaching work of the University and its colleges, which has led to some friction, and has tended to the impoverishment of undergraduate work.

- (f) It is impossible for the scattered colleges in the mofussil in their present condition and with their existing resources to give to their students a training which would deserve to be described as university education. At present, moreover, these colleges suffer from lack of direct contact with the work of the University. Few of them have representatives upon the governing bodies of the University and those few only by accident. They have, therefore, no share in the responsibility for framing the courses of study which they pursue, nor can they adapt themselves to the needs of their districts.

The second volume is devoted to studies of special aspects of university work. The first chapter discusses the education of women, and gives not only a description of what is actually being done, but a demonstration of the immense local importance of this branch of work, and of the difficulties by which it is surrounded. Two lengthy chapters deal respectively with the examination system and with the medium of instruction. The former not only shows that the domination of examinations is more pronounced in Bengal than perhaps anywhere else in the world, but also brings out many of the problems of examination in a way that should be instructive elsewhere besides Bengal. The latter shows by an examination of evidence, that opinion in Bengal is deeply divided and greatly bewildered as to the extent to which the vernacular and English should respectively be employed in teaching. Then comes a chapter on the conditions of student life,

which draws a sad picture of the circumstances in which many of the students, especially in Calcutta, have to carry on their work, and of the dangerous results which often follow from them. A short chapter on the site of the University winds up the volume.

PROFESSIONAL AND TECHNICAL TRAINING.

The third volume is mainly occupied by chapters describing the provision now made for various branches of professional and technical training, teaching, law, medicine, engineering, agriculture and technology, the general result being to show that in all these fields save law and, in a less degree, medicine, the provision now made is quite inadequate to the needs of a modern and progressive community.

ADMINISTRATIVE PROBLEMS.

The volume ends with three chapters on administrative problems. The first of these shows that the governance and administration of the University is unsatisfactory and ineffective as an instrument for the encouragement of learning. The Senate has to serve as a representative assembly and at the same time to decide matters of detail appropriate to a small executive. It is neither large enough to reflect all the shades of relevant experience and opinion, nor small enough for the discussion of intricate affairs. The Syndicate is at once insufficiently representative, and too accidental in its composition to decide, with adequate knowledge of what they involve, all the problems which the insufficiently differentiated constitution of the University assigns to its care. The relations between the University and the colleges are such that, while there is no really effective means of securing the efficiency of the colleges, yet they are under unduly rigid control which restricts their freedom of action and makes it difficult for them to show any independent initiative. The University is also loaded with administrative functions, particularly in regard to

the recognition of schools, which it cannot adequately perform, and which bring it into difficult relations with the educational organization of the state. The second of these chapters deals with the position of Government in regard to education. The Commissioners urge that the relations between Government and the University are of an unsatisfactory kind, involving far too much detailed Government intervention which cannot be satisfactorily exercised and which undermines the sense of responsibility of the university authorities; while the peculiar relation between the University of Calcutta and the Imperial and provincial Governments adds an element of complexity and confusion which is not found in the other Indian universities. A section of this chapter is devoted to a discussion of the vexed question of Government service. After enumerating certain advantages in the Government service system, the Commissioners contend that these advantages are more than outweighed by grave disadvantages. The system is marked by undue rigidity; the distinctions between its grades arouse irritation and sometimes lead to unintentional injustices; it gives rise to administrative inconveniences, and from this point of view has been condemned by many leading members of the educational services themselves and by several directors of public instruction: it tends to officialize education and centralize its organization: and it embarrasses the privately managed schools, because their field of choice is restricted by so large a proportion of qualified teachers being confined to schools under Government management. A later section of the chapter deplores the practice which has been followed ever since the foundation of the Indian universities of treating university qualifications as the sole formal credentials for public employment—a practice which has been insensibly extended so that even minor clerkships are in a large degree filled in this basis. The final chapter of the volume indicates that each Indian university

tends to become a water-tight compartment and that the connexion between the Indian universities and those in other lands is not as close as it should be.

The fourth and fifth volumes contain the exposition of the main structural reforms proposed by the Commission, and the arguments upon which they are based. The Commissioners point out that it is a programme which it must take years to bring to full fruition even under the most favourable circumstances, and which will require considerable financial assistance from public and private sources. Two members of the Commission, Dr. Zia-ud-din Ahmed and Dr. J. W. Gregory, add notes in which, while accepting the main features of the scheme, they suggest variation in detail, some of which are of importance.

SUMMARY OF RECOMMENDATIONS.

1. The recapitulation of our main recommendations set out below, is intended for convenience. The precise phrases of the following clauses must not be regarded as authoritative in themselves, but must be interpreted in the light of the fuller statement embodied in the foregoing chapters, to which references are appended in the margin. Moreover, we desire it to be understood that the recommendations set out below do not constitute the whole of our recommendations, but embody chiefly those upon which we think that immediate or early action ought to be taken. Many recommendations and suggestions, intended for the guidance of the new governing bodies of the universities, or of the proposed new authority for secondary education, are not here referred to, but will be found, with the considerations on which they are based, in the main body of the report.

SECONDARY EDUCATION.

2. No satisfactory reorganization of the university system of Bengal will be possible unless and until a radical reorganization of the system of secondary education, upon which

university work depends, is carried into effect. The deficiencies of the existing secondary system are radical and patent. They arise, in the main, from four principal causes. (a) In the first place, most of the high English schools are under-equipped and are conducted by an underpaid and for the most part an untrained staff. (b) In the second place, they are unduly dominated by an examination (the matriculation) which is itself ill-designed and not of sufficiently high standard, and which gives no encouragement to many lines of study necessary for the welfare of pupils and for the prosperity of the country. (c) In the third place, owing to the existing division of authority between the University and the department of public instruction there is no adequate machinery for supervising, guiding and assisting the work of the schools as a whole; in other words, no coherent system of secondary education yet exists. (d) In the fourth place, a large and vitally important part of secondary instruction is actually conducted, not by the schools, but by the colleges of the University in their intermediate classes; and, because it is so conducted, it largely fails of its purpose partly because the methods chiefly employed (those of the mass-lecture) are unsuitable for work at this stage, and partly because many subjects and lines of study, especially those which have a vocational bearing, are almost wholly disregarded.

3. A radical reform of these conditions is necessary not only for university reform but also for national progress in Bengal. The principal changes which we recommend for this purpose are as follows:—

(i) The stage of admission to the University should be (approximately) that of the present intermediate instead of that of the present matriculation.

(ii) The duty of providing training at the intermediate stage should be transferred from the universities to new institutions to be known as 'Intermediate Colleges' some of

which would be attached to selected high schools, while others should be organized as distinct institutions. There should be at least one intermediate college in each district of the presidency, besides a certain number in Calcutta and Dacca; and the courses of the intermediate colleges should be so framed as to afford preparation not only for the ordinary degree courses of the University in arts and science, but also for the medical, engineering and teaching professions and for careers in agriculture, commerce and industry.

(iii) The intermediate colleges for men should in all cases be separate from degree colleges, and even where they are provided or managed by closely likened authorities, should be organized under a distinct educational and financial control.

(iv) There should be two secondary school examinations, the first, approximately corresponding to the present matriculation, to be taken at the end of the high school stage, at the normal age of 16, or, in special cases, at the age of 15, and to be known as the high school examination; the second, approximately corresponding to the present intermediate, but much more varied in its range, to be taken at the end of the intermediate college course, at the normal age of 18, and to be known as the intermediate college examination. Success in this examination should constitute the normal test of admission to university courses. The range and standards of both of these examinations should be carefully reconsidered. Detailed recommendations on these heads will be found in Chapter XXXI, paragraphs 31-70, and in Chapter XXXII.

BOARD OF SECONDARY AND INTER-MEDIATE EDUCATION.

(v) The existing department of public instruction is not so organized as to be able to regulate and supervise the new system; more than half of the high English schools are at present entirely outside its jurisdiction. And

although the university is entitled to a large voice in their affairs, its governing bodies cannot be so organized as to be able to deal effectively with them, especially as they lack the necessary funds. We, therefore, recommend that there should be established a Board of Secondary and Intermediate Education, to consist of from fifteen to eighteen members, with power to appoint advisory and other committees including outside members. Among the statutory committees of the Board should be included a committee on the education of girls and a committee on madrasahs, the latter to conduct the examination of the reformed madrasah course. The Board should also have the power to constitute provincial or divisional advisory councils.

(vi) It should be provided that a majority of the Board should consist of non-official members, and that the Board should always include at least three representatives of Hindu and at least three of Muslim interests. Subject to these provisos, the Board should include : (a) salaried president, appointed by Government ; (b) the director of public instruction *ex-officio* ; (c) a member elected by the non-official members of the Bengal Legislative Council ; (d) five representatives appointed by the University of Calcutta and two by the University of Dacca ; (e) from five to eight members appointed by Government among whom should be included (if not otherwise provided for) representatives of the needs of industry, commerce, agriculture, medicine and public health, secondary and intermediate education, the educational needs of girls and those of the domiciled community.

(vii) The powers of the Board should be : (a) to define the various curricula to be followed in high schools and intermediate colleges ; (b) to conduct the two secondary school examinations described above, subject to the proviso that the universities should in each case have the power to determine what forms of the intermediate college examination

they would accept, and under what conditions, as qualifying for admission to their courses in various faculties ; (c) to grant, after inspection, formal recognition to high schools and intermediate colleges as qualified to present candidates for the high school or the intermediate college examinations, and an adequately organized and equipped places of instruction ; (d) to advise Government as to the needs of these grades of education, and as to the best modes of expending the available funds for these purposes. In the opinion of the majority of the Commission it is essential for the adequate performance of the functions of the Board that it should have an inspectorial staff of its own and that it should exercise substantial executive powers, especially in regard to the distribution of grants to schools and intermediate colleges (within the limits of the allotments made for these purposes by Government in its annual budget), and in regard to the exercise of control over such high schools and intermediate colleges as may be maintained out of public funds.

(viii) The Board thus organized, with its president should not be wholly separated from the department of public instruction, but should be regarded as an important branch or aspect of the whole system of educational organization, closely linked with the other branches, especially through the director of public instruction. The character of the director's office would thus be materially changed. He would be relieved of much detailed work, but he would become chief of the staff and expert adviser to the member or Minister in charge of education, and would himself be in touch with all the aspects of educational work. To express this important change in the functions of the director we recommend that he should be given the position of a secretary to Government.

(ix) In order to give unity to the educational system by reducing the existing cleavage between Government schools and

colleges and privately managed schools, and by facilitating an interchange of teachers among these institutions, the main body of the teaching staff of the Government schools and intermediate colleges should be gradually reorganized upon a professional rather than a service basis, the fullest safeguards being taken to protect the actual or prospective rights of members of the existing services, and to ensure an adequate salary scale and reasonable security of tenure under the new system. At the same time superannuation fund for teachers should be organized to replace the existing pension system for future recruits to the profession. To this superannuation fund all aided schools should be encouraged to contribute.

(x) In view of the need of enlisting the services of a number of western-trained teachers in the reorganization of secondary and intermediate work in Bengal, a special corps of western-trained teachers should be organized the members of which should be enlisted not on uniform graded rates of pay, but on such terms and conditions as might be necessary to secure the right types of men and women in each case. Their services should be available; under the direction of the Board, either in Government institutions or in private institutions which expressed a desire for their services.

GENERAL RECOMMENDATIONS REGARDING UNIVERSITY WORK.

4. Although an effective reorganization of secondary and intermediate education would greatly improve the quality of university work, by improving the quality of the students entering the university, and by withdrawing for more appropriate treatment very large numbers of students who are unready for university methods of instruction, this would not of itself remove the grave evils which now exist; the university system of Bengal is, in our judgment, fundamentally defective in almost every aspect, and, in so far as it does good work, does it in spite of the method of organization now in vogue.

5. The defects of the system which we have analysed in detail in the earlier part of this report, affect primarily the students following courses in the faculties of arts and science, who number about eleven out of every thirteen of the total. These defects may be briefly summarised as follows:—(a) the numbers are too great to be efficiently dealt with by a single university organization and this will remain true even if the intermediate students (two-thirds of the whole number) are withdrawn. (b) The undergraduate courses of instruction in arts and science are given by colleges which are almost entirely self-contained and in many cases widely scattered, and generally too meagrely staffed and equipped to be able to do justice to their students; some of them being wholly, and most of them mainly dependent upon the fees—paid by the students—a source of income wholly inadequate for the purpose. Even in Calcutta, where there are many colleges, there is no efficient co-operation. (c) The courses of instruction are too predominantly literary in character and too little varied to suit various needs; nor is there adequate provision for training in technical subjects. At the same time, the methods of instruction are far too mechanical depending mainly upon mass lectures, and giving a quite insufficient place to individual guidance and advice, nor do they allow for variation of method to meet the needs of different students. This is due in part to the enormous numbers which have to be dealt with; in part to the influence of a bad tradition; but mainly, perhaps, to the fact that since the university is (in regard to undergraduate work) almost exclusively an examining body, external to the colleges, the colleges tend to regard themselves as mere coaching institutions and the influence of the examinations exercises an undue domination over the minds of teachers and students alike. (d) The great majority of the teachers are gravely underpaid, and have no legal security of tenure and next to no freedom

in their work, while most of them have no prospect of attaining to positions of dignity and importance such as would from a stimulus to good work; the result is that the profession of a college teacher has no prestige and attracts few men of the highest ability. (e) While the university has recently undertaken the direct control of almost the whole of the post-graduate work for the degrees of M.A. and M.Sc., and has brought about considerable improvements in this regard, there is, because of this division, an unhappy cleavage between the higher and lower teaching work of the University and its colleges which has led to some friction, and has tended to impoverishment of undergraduate work. (f) The system of government and administration of the university is unsatisfactory and ineffective as an instrument for the encouragement of learning; and the relations between the University on the one hand and the colleges on the other are of such a kind that, while there is no really effective means of securing the efficiency of the colleges, yet they are under an unduly rigid control which restricts their freedom of action and make it difficult for them to show any independent initiative. (g) The University is loaded with administrative functions, particularly in regard to the recognition of schools, which it cannot adequately perform, and which bring it into difficult relations with the educational organization of the state. (h) The relations between Government and the university are of an unsatisfactory kind, involving far too much detailed Government intervention which cannot be satisfactorily exercised and which undermines the sense of responsibility of the university authorities; while the peculiar relation between the University of Calcutta and the Imperial and provincial Government adds an element of complexity and confusion which is not found in the other Indian universities. (i) The regulations which govern the work of the University are unduly rigid and difficult to modify. (j) Despite consistent efforts and large expenditure

during recent years, the conditions under which many of the students live are such as must be deleterious to their health, morals, and work; and there is a lack of that corporate spirit which constitutes one of the most educative factors in university life. (k) Finally, owing to the practice which has been followed ever since the foundation of the Indian universities of treating university qualifications as the sole formal credentials for public employment, a practice which has been insensibly extended so that even minor clerkships are in a large degree filled on this basis—too many of the students think of their university course not as a thing worth pursuing for itself or as a training for life but simply as a means of obtaining admission to careers for which in many cases no university training ought to be required.

6. One of the essential and most efficient remedies for the evils described in the foregoing paragraph is the creation of new universities wherein the teaching function can be assured of its due predominance. To this end we recommend the organization of the teaching resources which exist in the city of Calcutta in such a way as to create a real teaching university: we recommend that the project of a university at Dacca should be carried into effect at the earlier possible moment; and we also recommend the adoption of a mode of organization for the mofussil colleges which will encourage the gradual rise of new university centres by the concentration of resources for higher teaching at a few points. But before we turn to these proposals it will be convenient to set forth certain general recommendations affecting all the university organizations alike, Calcutta, Dacca, and the future or 'potential' universities of Bengal.

7. The following recommendations are applicable to all universities which may now or in the future be created in Bengal;—

(ix) The Governor-General and the Government of India should cease to stand in

the special relationship which they at present occupy in relation to the University of Calcutta. The Imperial Legislative Council should retain responsibility for all legislation affecting the fundamental Acts of universities; and the Governor-General should assume the office of Visitor of the Universities of Calcutta and Dacca and of any future universities which may in future be created in Bengal performing (with the aid of a special organization for university work) the functions of visitation, of advice in regard to the co-ordination of effort with the universities of other provinces, of giving encouragement and assistance to research, and of affording help in the recruitment of teachers. We venture to suggest that it would be advantageous if these visitorial functions were similarly exercised over all the universities of British India.

(xii) The Governor of Bengal should be Chancellor of the Universities of Calcutta and Dacca, and of any future universities in Bengal, performing functions in many respects different from those now assumed by the Chancellor; these functions are more fully defined in Chapters XXXIII, XXXVII and L.

(xiii) The Government of Bengal should take the place of the Government of India in all ordinary dealings between the state and the universities in Bengal; though the functions of Government in this regard should be in many respects different from what they now are, and in particular, should involve much less detailed interference in academic affairs than is now the case.

(xiv) The regulations governing the work of the universities should be made less rigid, and should be classified in accordance with the character of their subject-matter. The classification which we recommend is as follows:—(a) The *Act*, made and alterable only by the Imperial Legislative Council; (b) the *Statutes*, made in the first instance as a schedule to the Act (by the Imperial

Legislative Council, but subsequently capable of being altered or added to by the Court of the University, subject to the approval of the Government of Bengal; (c) the *Ordinances*, made by the Executive Council of the University subject to ratification by the Court, the Chancellor having the right of vote; (d) the *Regulations*, made by appropriate bodies in the University to which such powers are entrusted by Statute or Ordinance.

(xv) Honours courses, distinct from the outset from pass courses, should be instituted in the universities in order to make provision for the needs of abler students; and the pass courses should be arranged in coherent groups of subjects. Facilities should be afforded for change from pass to honours courses and *vice versa*.

(xvi) The duration of the degree course should be three years after the intermediate stage; this provision being applied immediately in regard to honours courses, and at an early date in pass courses. In appropriate cases honours graduates should be permitted to proceed to the degree of M.A. one year after taking their degree.

(xvii) The titles of professor and reader should be strictly reserved for persons upon whom these titles are conferred by a university, and who are in receipt of a minimum salary, to be defined.

(xviii) Appointments to professorships and readerships should be made by special selection committees, including external experts; and, in order that there may be in each university a certain number of western-trained teachers of these ranks, a defined number of professorships and readerships in each university should be appointed on the nomination of selection committees acting in England, but including representatives named by the University.

(xix) Small Civil Service Commissions should be appointed in connexion with the Government of India and the Provincial

Government. The duties of these Commissions should be (a) to define the stage of educational attainment which should be required in the case of various groups of posts under Government; (b) to conduct competitive tests among qualified candidates for such vacancies as may be announced, under such conditions as may be defined; (c) to approve all appointments made by direct nomination in cases where this method of appointment is held to be desirable.

(xx) In view of the necessity for paying greater attention to the health and physical welfare of students, a director of physical training holding the rank and salary of a professor, should be appointed in each university; and a Board of Students' Welfare, including medical representatives, should be one of the standing boards or committees of each university. Responsibility for the supervision of the conditions of students' residence should be assigned to the appropriate authorities.

(xxi) Having regard to the comparatively backward condition of the Muslim community in regard to education, every reasonable means should be taken to encourage Muslim students, and to safeguard their interests. We have held this need always in view, and our numerous and important recommendations to this end are summarized in a special chapter.

RECOMMENDATIONS RELATING TO THE UNIVERSITY OF DACCA.

8. The establishment at Dacca of a new university of the teaching and residential type was promised by the Government of India in 1912, and an elaborate scheme for its organization has been published. Even if no such undertaking had ever been given, we should have recommended the establishment of a teaching university at Dacca, as a means of relieving the pressure on Calcutta, and of introducing, under favourable circumstances, new methods of university organization. The importance of the city of Dacca

as the second town in Bengal and the centre of Eastern Bengal, as well as the number and variety of its educational institutions, render it a favourable site for an experiment of this order.

9. While we recognize the great value of the original report of the Dacca University Committee, which set before India, for the first time in a clear form, the ideal of a residential and teaching university, we think that for the sake of economy and simplicity of organization it is desirable to depart from some of the main features of the scheme embodied in the report. In particular we think that the conditions now existing, and the changes suggested in other parts of our scheme of reform (notably the system of intermediate colleges), render it desirable to depart from three features of the original scheme: (a) the organization of the university as a purely government institution; (b) the organization of the university upon a collegiate basis; and (c) the staffing of the university almost wholly by means of service appointments. Nor do we think it desirable that separate and distinct provision should be made for the needs of the well-to-do classes as proposed in the original report. And we have not thought it necessary to follow the Dacca University Committee in defining in detail the courses to be followed, since this seems to us to be an essential function of the new academic bodies when constituted.

10. We hold it to be of great importance that the new University at Dacca should be set on foot at the earliest possible date; and for that reason, we should advocate its establishment even if it be not found possible at once to provide all the additional equipment required. Our recommendations in regard to Dacca are as follows:—

(xxii) The University of Dacca should be established as a unitary teaching university, wherein all formal instruction given in the name of the university should be given by

officers of the university and under the direct control of the university authorities, no collegiate organization being interposed between these authorities and the students.

(xxiii) The principal authorities of the University should be:—(a) the Visitor (the Governor-General of India); (b) the Chancellor (the Governor of Bengal); (c) a full-time salaried Vice-Chancellor; (d) a widely representative Court, including *ex-officio*, elected and nominated members; the Court should have the power of making statutes, of approving the financial policy of the university, and of generally reviewing its work, and, since so large a body could not meet frequently, it should elect a Committee of Reference to represent it in dealing with the Executive Council; (e) a small Executive Council, with substantial powers of control over finance and the general policy of the university and with power to make Ordinance; (f) an academic council including the principal teachers of the university, and having large independent powers in all purely academic questions affecting courses of study, examinations and degrees; (g) Faculties, Boards of Studies and other statutory boards.

(xxiv) Government should make to the university a stated annual block-grant, leaving to the university authorities (subject to annual audit) the responsibility for expending these funds in the most economical way, and for raising, by private contribution or otherwise, such additional funds as may be necessary. An estimate of the amount required for this annual grant will be found in Chapter LI.

(xxv) The teaching staff of the university should ultimately be appointed by the university itself acting through selection committees which should include (in the case of the more important posts) external experts appointed by the Chancellor; a certain number of defined posts being filled after nomination by a selection committee acting in England, on which the University should be

represented. This system can only gradually be brought into operation; and in the first instance it will be necessary to provide the most complete safeguards for the rights, actual and prospective, of the existing members of the educational services engaged in educational work in Bengal. For this reason the initial appointments should be made by the Government of Bengal, with the advice of the Vice-Chancellor and the director of public instruction. Minimum salaries should be defined for each class of posts; but the authorities of the University should be free to define the actual salaries to be offered in each case above this minimum. The fulfilment of the contracts of appointment should be guaranteed by Government, the guarantee being readily enforceable owing to the fact that the University will be in the main dependent upon Government grants.

(xxvi) The teaching work of the University should be organized in departments, each under the responsible charge of a principal teacher, who should usually be a professor, though in some minor subjects he might be a reader. The head of the department should be responsible for the general organization of the work in his subjects, including tutorial guidance. The details of the departments which seem to be necessary at the outset will be found in Chapter XXXIII.

(xxvii) The University should be a residential university not in the sense that all students should be required to live in halls or hostels which are under university control, but in the sense that the majority of the students will need to have such residences provided for them, that the provision and conduct of these residences will be systematically organized, under the direction of the University, and that the residential units will be utilised for the development of social life. The residences should be arranged in large units to be known as halls, each presided over by a senior member of the staff to be

known as the provost, and sub-divided into houses, each in charge of a tutor and assistant-tutors drawn from the teaching staff of the University. Room should be found for smaller residential units provided by private agency with the approval of the University; these should be known as hostels, and each should be in the charge of a warden.

(xxviii) In order to meet the needs of the Muslim community, which is numerically preponderant in Eastern Bengal, a special department of Islamic studies should be organized, leading up to a degree, and forming the culmination of the reformed Madrassah course, in accordance with the scheme laid down by the Dacca University Committee. In order that this branch of study may be placed on a parity with other courses, the first two years of it (corresponding to the intermediate course in arts or science) should be conducted by the Dacca Madrassah, which should for this purpose be organized on the lines of an intermediate college.

There should be a strong representation of Muslim interests upon all the governing bodies and the principal boards and committees of the University; there should also be a Muslim advisory committee; and one of the halls should be specially organized for Muslim students.

RECOMMENDATIONS FOR THE ESTABLISHMENT OF A TEACHING UNIVERSITY IN CALCUTTA.

11. It is in our judgment essential that the teaching resources existing in the city of Calcutta should be so reorganized as to ensure that the best available teaching shall be open to all students so far as accommodation and time-table permit. It is impossible, in Calcutta, to effect this on the lines of a unitary university such as we have proposed to establish in Dacca, because the numbers to be dealt with are too large while the colleges, many of which have done valuable work during a long period, cannot be disregarded. What is needed is a new synthesis between

the University in its teaching aspect, and those colleges which are sufficiently well-equipped to be capable of taking part in a system of co-operative teaching. We have considered a number of alternative schemes for the solution of this difficult problem, and while we have been unable to accept any of these in full, we have found many suggestions in them. To carry into effect the reorganization which is required a complete reconstruction of the system of university government will be necessary. It will also be necessary that the colleges should abandon the ideal of being self-contained and self-sufficient, to which the existing system has tempted them to cling, and should be prepared to co-operate with one another and with the University; that new and more effectual means should be devised for enabling the University to exercise a due control over the quality and character of the teaching given in its name, without impairing the freedom of good colleges; and that, in the system as a whole there should be a great increase of elasticity such as will enable the colleges to pay due regard to the varying needs of their students.

12. In order that the synthesis between the University and its colleges may be made effective, many changes in the present system will be necessary. (a) Those colleges which are to take part in a co-operative system must be more adequately staffed and equipped than these now are; and in order to make this unmistakably clear, it will be necessary to classify the colleges in such a way as to admit to the privileges of the co-operative system only those colleges which are able to make a real contribution to it. This distinction will be more fully developed later. (b) The colleges which are fit to take part in a co-operative system, and only these, must, as such, be directly and effectively represented upon the academic bodies of the University, which ought to consist largely of members of the teaching staffs of

such colleges. (c) The University thus reconstituted, ought to be in a position to ensure, more fully than is now possible, that the teaching given in its name is of adequate quality, while at the same time the colleges ought to retain control over, and responsibility for, the appointment of their own teachers. (d) The colleges ought to have greater freedom than they now enjoy in arranging and directing the work of their students, partly by having a larger voice in the definition of curricula, but still more by being free to determine, within defined limits, how much formal instruction, and of what kinds their students should receive; and they should enjoy this freedom in regard to pass, honours and post-graduate students. (e) The colleges ought to take their share in post-graduate work, and the University ought to take its share in undergraduate work; and the instruction of the best teachers in the University and in all the colleges (to which the majority of the university teachers should be attached) should be made available so far as practicable for students from all the colleges. (f) The University ought to be responsible for facilitating this, by arranging for the best college teachers to give lectures which will be open to all the students, and by issuing lists of such lectures; while the colleges ought to be responsible for advising their students how far they should resort to these lectures, how far to ordinary college lectures, and how far they should utilise other forms of college instruction, in small classes, *etc.* (g) In addition to providing lecture instruction, the colleges should be made responsible for giving individual guidance and advice to students on a far more adequate scale than is now usual, and for ensuring that their students reside in proper conditions and have reasonable opportunities for physical training and recreation and for social intercourse. In short we desire a new synthesis between the work of the University and the work of the colleges, a synthesis

in which the colleges could not dominate the University nor the University dominate the colleges, as if the former were a separate organization. This would not be the case, because the University would be fully representative of all academic interests and every aspect of academic life.

13. Some colleges in Calcutta will at first be incapable of taking part in such a co-operative system as we have wrought out. For these colleges temporary provision on something like the existing basis will be necessary, until they shall have been enabled—we hope with both public and private assistance—to bring themselves up to the requisite standard. Provision will also have to be made for the needs of mofussil colleges, a problem which is separately dealt with below. But all these needs have to be kept in view in devising the new organization, and especially in dealing with critical and vitally important period of reconstruction, which will certainly cover a period of several years. Our recommendations in regard to the teaching university of Calcutta are briefly set out below; but the problem is so complex that here, even more than elsewhere, it is necessary to note that our scheme of reform can only be fully understood by reference to the chapters (especially XXXIV and XXXVII) in which it is worked out in detail. Any brief summary is liable to be misleading.

14. With these provisos, our recommendations for the organization of a teaching university in Calcutta may be summarized as follows:—

(xxx) The system of governance of the University should be reconstructed; and in future the authorities of the University of Calcutta should be:—

- (a) the *Visitor* (the Governor-General of India)
- (b) the *Chancellor* (the Governor of Bengal)

- (c) A salaried full time *Vice-Chancellor* with the pay and status of a High Court Judge.
- (d) A *Treasurer*
- (e) A widely representative *Court*, including *ex-officio* and elected members, and a small number of nominated members. The Court under our scheme would have several hundred members, and be representative of every important educational interest in Bengal. It would (1) make statutes and ratify ordinances, (2) review the work of the university, and (3) approve the financial estimates. As a body so large could not often meet, it should elect a *Committee of Reference*, to act on behalf of the Court in sundry matters.
- (f) A small *Executive Council* of seventeen members which should be responsible for the financial and administrative management of the University, and should have power to make ordinances.
- (g) An *Academic Council* of eighty to one hundred members, including representatives of all constituent colleges and of all grades of teachers, which should be responsible, for regulating the teaching work of the university, and in general for purely academic questions.
- (h) Faculties, Boards of Studies, Committees on Courses, a Board of Examinations, a Board of Students' Welfare, and other standing boards and committees (including the Mofussil Board and the Board of Women's Education separately referred to below).

xxxi. The university should be organized primarily as a teaching university, consisting of incorporated and constituent colleges; the incorporated colleges being institutions owned and managed by the university itself, the constituent colleges being distinct corporations enjoying full membership of the university, fulfilling defined conditions, performing defined functions and enjoying defined privileges. The affiliating functions of the university (in regard to temporarily affiliated colleges in Calcutta, and to mofussil colleges) should be regarded as subsidiary, and of a more or less temporary order.

xxxii. The conditions of admission to the rank and privileges of a constituent college should be laid down by statute, and should define (a) the number of students such a college may admit; (b) the number of teachers to be provided in proportion to the number of students; (c) the minimum rates of pay and conditions of service to be provided by the college for its teachers; (d) the conditions to be observed by the college regarding the residence of students; (e) the minimum accommodation and equipment (including libraries and laboratories) to be provided in the subjects in which the college had recognized teachers; (f) the method of administration of the college; (g) the conditions under which teachers appointed by a college should be subsequently approved by the university, and the extent to which such approval should be required, provided always that the college should have control over appointments to its own staff. The colleges admitted to constituent rank should be named in a statute, any alteration of which require the assent of the Government of Bengal.

xxxiii. Colleges admitted to constituent rank should enjoy the following privileges:— (a) they should each be directly represented upon the academic council; (b) their students (undergraduate and post-graduate) should be entitled to attend university and inter-collegiate lectures without payment of special fees;

(c) their 'recognized' teachers should be eligible for appointment as university professors, readers, lecturers and examiners without leaving their colleges, and for membership of all academic bodies; (d) they should have full control over the discipline of their students, and (subject to general regulations) over the amount and type of instruction to be received by them.

xxxiv. In the proposed system of co-operative instruction the functions of the University should be (a) to define the curricula of studies; (b) to provide for the use of teachers and students libraries, laboratories and other equipment necessary to supplement those of the colleges, as well as lecture-rooms at head-quarters; (c) to provide teachers especially in subjects not taught by the colleges—teachers in subjects of college instruction, whether for undergraduate or post-graduate work, being normally provided in conjunction with a college or colleges; (d) to 'appoint' college teachers to give in addition to their ordinary college work courses of instruction (both undergraduate and post-graduate) which will be open to the whole University and to make payment for such courses; (e) to 'recognize' college teachers whose work is confined to the colleges. Once recognized, no teachers should require fresh recognition for work of the same grade even if he leaves his college. The University should define the minimum qualifications which it will normally accept for teachers working as junior assistants, or as college teachers respectively. All college teachers should be submitted for recognition immediately after their appointment by the college, and recognition should only be refused on the express ground that the candidate was not qualified for the work proposed to be allotted to him. A denial of recognition by the University should not invalidate the appointment of a college teacher; but if at any time the number of unrecognized teachers employed by a college should reach one-fourth of the total, this would be

regarded as justifying a withdrawal of its privileges from the college, and the matter should be laid before the Court with a view to an amendment of the Statute conferring constituent privileges upon the college.

xxxv. In the proposed system of co-operative instruction the functions of the college should be (a) to direct the studies of their students, both undergraduate and post-graduate, and the courses they are to pursue, subject to any general regulations laid down by the University; (b) to decide what, if any, university or inter-collegiate lectures they shall individually attend; (c) to provide such courses of lectures, special classes, and other forms of instruction as in the judgement of the college authorities may be required by their students; (d) to provide for every student individual guidance and advice in his studies; (e) to certify to the University that every student before submitting to examination has undergone a systematic course of instruction in all his subjects, or to withhold such certificate where necessary; (f) to provide the necessary teaching equipment in the subjects in which it undertakes to give instruction; (g) to supervise the residence, health and discipline of their students. The colleges should enjoy freedom and responsibility in performing these functions, and in particular in appointing its staff. The staff of a college might under this system include teachers of three grades:—(a) college teachers who are also 'appointed' teachers of the University, partly paid by the University, and some of whose lectures are open to the whole University; (b) college teachers who are 'recognised' teachers of the University, but whose instruction (except by special arrangement) is open only to students of the college; (c) unrecognized teachers, who should be few in number.

xxxvi. Presidency College which has always been the principal and the best equipped centre of teaching in the University,

should continue to play this part but its resources should be so far as possible made available in the University as a whole. Hitherto Presidency College has represented the principal contribution of Government to collegiate education in arts and science for men students in Calcutta. In order that Presidency College may freely play its part in the new system, along with other constituent colleges, and in order that this aspect of the financial responsibility of Government for university education may be clearly defined, the college should be recognized under the direction of a governing body appointed by Government, and including also representatives of the university and of the college teachers. The governing body should be allotted a stated annual block-grant at least equal to the total present expenditure on the college, and should (subject to annual audit) be free to expend this revenue together with any other sources of revenue which might accrue from fees, subscriptions or endowments, at its discretion. It should (subject to the fullest safeguards for the existing and prospective rights of members of the educational services) be free to make appointments to vacancies in the teaching staff without reference to service rules, under such conditions as might be defined by Government at the time of transfer, and in accordance with the regulations of the university; but at least ten chairs, to be held by teachers of the college, to be known as presidency chairs, and to carry all the dignity and privileges of professorships in the university, should be reserved for western-trained scholars, and should be filled after nomination by a selection committee acting in England; part of the instruction offered by the holders of these chairs being open to the whole university.

xxxvii. Appointments to professorships, readerships and lectureships in the university should, in every case, be made with the aid of a specially appointed committee of selection, which should, in the case of

professorships and readerships, include three external experts nominated by the Chancellor. In all cases in which a professorship or readership is associated with a particular college, or in which the college provides a part or the whole of the emoluments of the post the college should be represented on the committee of selection, and should have the power to veto any particular appointment. With this exception all appointments to teaching posts in a constituent college should be in the hands of college, the university reserving the power to give or withhold recognition.

xxxviii. Colleges which are unable to fulfil the conditions laid down for admission to constituent rank, but whose continued maintenance is necessary for the accommodation of students, should be granted, on defined conditions, the privileges of temporary affiliation for a period of five years, in order to give them an opportunity of satisfying the conditions for constituent rank. Such colleges should not be directly represented upon the governing bodies of the university; their students should not be eligible to attend lectures given by university teachers or approved teachers in the constituent colleges, except by special arrangements and on payment of a fee; their teachers should not, as such, be eligible as members of university bodies, or be recognized as university teachers, or be appointed as examiners. The affairs of colleges in this group should be controlled by a special committee reporting to the executive council, on which the colleges should not be represented, though they would have a right to be heard.

xxxix. It is necessary to afford financial assistance to colleges in order to enable them to fulfil the condition of admission to constituent rank. It is also necessary to establish at an early date new arts colleges, notably an Islamia college for Muslim students, to which university chairs or readerships in Arabic, Persian and Islamic history should be attached and an orthodox

Hindu College, based upon the degree department of the Sanskrit College, to which university chairs or readerships in Sanskrit and Pali should be attached.

xl. All colleges should be inspected at intervals of not more than three years, and a single general inspection report should be circulated.

xli. All applications to Government for additional assistance made by or on behalf of the university itself or any of its colleges, whether incorporated, constituent or temporarily affiliated, should normally be forwarded through the executive council (or commission) at a fixed time of year, and the executive council in forwarding them should be empowered to append its own comments and recommendations.

xlii. In view of the great difficulties attending a simultaneous transplantation of institutions so numerous as those connected with Calcutta University, and the certainty that unless all were transplanted, the co-operative system of teaching would be rendered impracticable, and in view of the impossibility of leaving city of the size of Calcutta, without university organization at its centre, we consider that the attractive proposal to remove the University to a rural or suburban site must be abandoned. The centre of the teaching and administrative work of the University should continue to be in the College Square area, where the administrative and teaching centres of the colleges should also be as far as possible concentrated. But land should be acquired in the suburbs for residential purposes and for playing fields; and the whole problem of the sites of educational buildings in Calcutta and its district should be carefully planned and worked out in connection with the Calcutta Improvement Trust and the Corporation.

xliii. In order to safeguard the interests of the Muslim community, there should be representatives of Muslim interests upon the principal governing bodies, boards and

committees in the University; the particulars of this representation will be found in Chapter XXXVII. We also recommend the establishment of a Muslim advisory board with power to address any constituted body of the University upon any question affecting the interest of Muslim students.

xliv. For the determination of any dispute between any college or university teacher and the appointing authority regarding the fulfilment of the teachers contract on appointment, the University should appoint a tribunal, by whose decision both parties should be bound to abide.

xlv. Any college or community or group of teachers who feel themselves aggrieved should have a right of appeal to the Chancellor, who should have power to appoint a small impartial commission of enquiry.

xlvi. The scheme of reorganization defined in the foregoing clauses involves far reaching and complex changes. The new governing bodies proposed to be established cannot be immediately organized until the classification of colleges is determined, and until the rearrangements necessitated by the system of intermediate colleges have been carried into effect. It is, therefore, essential that during the period of reconstruction there should be a small executive commission with exceptional powers. The arrangements which will be necessary during the period of reconstruction will be further discussed at the end of this chapter.

RECOMMENDATIONS REGARDING MOFUSSIL COLLEGES.

15. The problem of dealing with the scattered colleges in the mofussil is a very difficult one. It is impossible for them in their present condition and with their existing resources, to give to their students a training which would deserve to be described as university education. At present, moreover, these colleges suffer from lack of direct contact with the work of the University. Few of them have representatives upon the governing bodies of University, and those few

only by accident. They have, therefore, no share in the responsibility for framing the courses of study which they pursue, nor can they adapt themselves to the needs of their districts. These colleges will be deeply affected by the main features of our proposals; on the one hand by the manifestly superior training which will be obtainable when strong teaching universities are established in Calcutta and Dacca: on the other hand by the withdrawal of all the intermediate students on whose fees their existence largely depends. It would be excessively costly and indeed impossible, to bring them all up to such point of efficiency in respect of staff and equipment as would turn them into true university centres. On the other hand, it would be a disaster if, on these reasons, the whole body of mofussil degree students were drawn into Calcutta and Dacca.

16. We are satisfied that some form of special treatment is necessary for the mofussil colleges. We have discarded one proposal having this end in view—the proposal that a new University of Bengal should be forthwith established. We believe that the best solution will ultimately be that by a judicious concentration of resources a few of these colleges should be encouraged and helped gradually to develop into more highly organized and semi-independent institutions and ultimately, perhaps, into distinct universities; while others should become intermediate colleges. But we think that this change should not be unduly forced, and that some form of organization ought to be created which, while rendering possible the development that seems to us most desirable, would not exclude other possible solutions.

17. Our recommendations in regard to mofussil colleges, which are more fully set forth and argued in Chapters XXXV and XXXII, are as follows:—

(*xlvi*) The mofussil colleges should, for the present, remain in association with the University of Calcutta and the direction of their affairs should be entrusted to a special

Board of Mofussil Colleges, upon which every mofussil college teaching up to the degree level should be represented, while, in order to ensure equivalence of standards, there should be a substantial representation of the teaching university, and the Academic Council should be consulted upon all proposals affecting degree courses.

(*xlvi*) In order to encourage the growth of the stronger colleges which may be capable of becoming potential universities such colleges should on fulfilling certain defined conditions, receive the title and rank of 'University Colleges,' and should then be specially represented upon a special panel of the Board, and empowered, with the assent of special panel and of the Academic Council, to exercise a certain degree of autonomy in the framing of their courses and the conduct of their examinations.

(*xli*) Additional funds will be necessary for the development of the university colleges. Such funds as may be available for this purpose should be expended by Government after report from the Executive Councils (or Commission) of the University. All applications for additional assistance made to Government by or on behalf of mofussil colleges should be forwarded through the Executive Council (or Commission), which should, in forwarding them, be empowered to make its own recommendations and suggestions, and might ask for a report from the Board of Mofussil Colleges.

RECOMMENDATIONS REGARDING THE EDUCATION OF WOMEN.

18. We have been deeply impressed by the very great importance of encouraging a more rapid development of women's education in Bengal by the social difficulties with which this problem is surrounded, and by the extremely slight progress which has hitherto been made. But we are of opinion that, owing to the directness with which it touches deep social issues, this problem ought to be dealt with by bodies, especially

conversant with the needs and interests involved.

19. Our recommendations regarding the education of women and girls are as follows:—

(i) There should be standing committee of the Board of Secondary and Intermediate Education to deal with the education of girls, such committee to include women and to be empowered to consult bodies consisting of women only, in which *purdah* women could take part.

(ii) An attempt should be made to organize *purdah* schools for Hindu and Muslim girls whose parents are willing to extend their education to fifteen or sixteen.

(iii) In view of the small number of women candidates for university courses the intermediate classes should not be separated from the degree colleges for women.

(iii) We realise that an increasing number of women students will require the most advanced teaching that the university can provide. We hold, therefore, as a matter of principle, that women should be admitted as far as possible to the instruction provided or organized by the university. But we recognize that in the special circumstances existing in Bengal, the main provision for women's higher education must be made in distinct institutions and under special direction.

(iv) A special Board of Women's Education should be established in Calcutta University and should be empowered to propose special courses of study more particularly suited for women, and to organize co-operative arrangements for teaching in the women's colleges, more particularly for the medical courses.

(v) Relations should be established between this Board and the Governing Body of the Lady Hardinge Medical College for Women at Delhi.

RECOMMENDATIONS REGARDING THE GOVERNMENT EDUCATIONAL SERVICES.

20. In exploring the condition of secondary and university education in Bengal our attention has necessarily been much engaged by the working of the educational services. We have found that the service system had in the past a great deal to recommend it, notably the security of its tenure, the comparative adequacy of the salaries which it offered, the prestige which attached to it, and the convenience which it often displayed in enabling the exiguous available teaching force to be used at the points where it was most needed. We have found, also, that the system has attracted many able and devoted men to the service of education, and has obtained a very strong hold over the minds of Indian teachers, who in a multitude of cases prefer work under service conditions to any kind of teaching work. But our survey has convinced us that the disadvantage of a service organized on the existing basis go far under present conditions to outweigh its advantages. The system is in some respects marked by undue rigidity. The distinctions between its grades arouse irritation, and sometimes lead to unintentional injustice. It makes a sharp and in many ways unfortunate cleavage between those who are employed in Government schools and colleges, and the much larger and rapidly increasing number of teachers who are engaged in private schools and colleges. It gives rise to administrative inconveniences and from this point of view has been condemned by many leading members of the educational services themselves, and by several directors of public instruction. We have been convinced that the time is at hand when the service system of recruitment for educational work should be gradually abandoned, or be so transformed in character that the continued use of the term 'services' would be misleading; and that the organization of teaching work should be on a professional basis rather than on a service basis. But

this should be done by gradual stages and with every possible safeguard of the rights, present and prospective, of existing members of the services in all grades. The general character of our recommendations will already be apparent from earlier paragraphs, and notably from the recommendations numbered (ix), (x), (xxvi), and (xxxvii) above; they are also analyzed in Chapter L of this report. But it may be convenient here to summarize these changes in a single view, on the ground of the importance of the departure which we propose should be gradually made.

(lvi) In regard to the secondary and higher secondary branches of education we think that the ultimate establishment of a professional organization of the main teaching body in all schools under the direction of the board should be aimed at from the outset; teachers being free to transfer their services from private to Government schools or *vice versa*, and being all participants in a general system of superannuation, managed by the board. We recommend that reasonable conditions as to the salary and tenure of all teachers should be exacted by the board from all schools under its jurisdiction.

lvii. In view of the need of western-trained teachers in these grades of education, we have recommended the recruitment of a special corps of teachers, who would be employed and paid by Government (through the board) and would enjoy full security and pension rights. This 'corps' may be regarded as a modified service, but with two differences: (a) that there would be no fixed or invariable hierarchy of grades, and (b) that the work of the teachers so employed would not be limited to Government institutions.

lviii. For university work we consider the service system to be unsuitable, especially in its present form; and we have recommended that in the new university of Dacca, in Presidency College and in other Government colleges engaged in university work

appointments should in future be made not by the Secretary of State or by the local Government but by the governing bodies of the universities and colleges concerned. At the same time we have suggested safeguards against abuse (a) by providing for a special form of selection committee; (b) by providing that in the case of certain listed posts which it is desirable to fill with western-trained scholars of distinctions, nominations, should be made by special selection committees in England, which the University and the college (where a college is affected) would be represented; and (c) by the recommendation that Government should guarantee the salary and pensions or superannuation allowances attached to these posts.

lix. Our recommendations in this regard do not apply to the administrative educational services.

THE COMPARATIVE ADVANTAGES OF A GOVERNMENT SERVICE OF TEACHERS AND OF AN ORGANIZED TEACHING PROFESSION.

21. In view of the great importance of the issues which are involved in this question, it will be convenient that we should here state more fully the chief reasons which lead the majority of us to regard a professional rather than a service organization of teachers on the whole and ultimately, the better adapted to the needs of a comprehensive system of education.

22. The teaching profession is not one of those which can be allowed to rely solely on fees paid by the public for professional services. Under such an arrangement sound education cannot be rendered accessible to all at a sufficiently low fee; still less could it be made gratuitous at any of its stages. The action, in some form or other, of the State is indispensable. The State, for the common good, must subsidise the work of teaching. This necessarily raises the question what kind and degree of control over the teachers the granting of State subsidies

should involve. Should this control be exerted directly or indirectly, *i.e.*, by subsidising a profession or by making teachers members of the Government service, or by both methods concurrently?

23. Government service for the teaching profession has many administrative advantages. It provides cadres of appointment, well-defined increments of salary, a pension system, rule of leave, a convenient subordination of ranks, and opportunities for disciplinary control. By some, the status of Government employment is highly valued, perhaps by more the security of tenure which such service generally implies.

24. On the other hand a teacher's duties are only in a minor degree administrative. For this reason the methods of transfer and of promotion which in the administrative services on the whole work well are much less well adjusted to the needs of colleges and schools. In an administrative service, length of official experience is such an important factor in each individual officer's efficiency that the advantages of promotion by seniority generally outweigh its disadvantages, provided that the rule is elastic enough to allow for making occasional exceptions. In teaching, on the other hand, length of experience is as a rule much less important relatively than personal characteristics and individual gift. For this reason to select a candidate from a number of applicants in view of his special fitness for a particular post in a particular school is in this case naturally a more suitable method of appointment than is promotion by seniority in a cadre of a grade service. In an administrative service the head of a department, though he may be at a distance, can usually judge with comparative certainty whether the transfer of an officer from one post to another will be advantageous to the service as a whole. But in the case of the transfer of a teacher, it is the domestic conditions and internal efficiency of each of the two institutions concerned which have

principally to be borne in mind. And of such matters no authority at a distance can feel with confidence that it is fully informed.

25. In the second place, Government service for teachers, if organized upon a basis which covers the whole of a country, conflicts with what should be the responsible freedom of local authorities and of the governing bodies of endowed schools (if the latter are brought within the scope of the system) in making appointments to the staffs of the schools under their care. The system tends to officialize education and to centralise its organization. But every good school should desire to cultivate special characteristics and to preserve the good traditions of its corporate life. Such distinctiveness and individuality among schools must increase in proportion to the degree in which the school system adapts itself to the varied preference of the people which it serves. These characteristic differences, between schools call for a method of appointment which allows the members of the appointing body which has intimate knowledge of the needs of the institution concerned to select (subject to conditions laid down by public authority with regard to professional qualifications) the applicant whom they deem to be the best adapted to the circumstances of the particular school.

26. In the third place, privately managed schools, however efficient, are put to disadvantage by the system, because their field of choice is restricted by so large a proportion of qualified teachers being confined to schools under Government management. Government service for teachers, unless it covers the whole field of education, tends to divide the body of teachers into two groups those in Government schools and those in privately managed schools. Such a division entails some risk to the unity of national education. It is possible to allow on approved conditions selected privately managed institutions to avail themselves, whether at the expense of Government or at their own

expense, of teachers who have been appointed and are paid by Government. But many difficulties are inherent in such an arrangement, except when (as is the case in one of our own recommendations) the plan is introduced on a subsidiary scale.

27. In the fourth place, as teaching is an art rather than a business, and as the highest functions of a teacher are scholarly and pastoral rather than administrative, the conditions of employment best adapted to such a calling are those which allow the greatest freedom to individual initiative and self-expression. These conditions are found in a professional organization rather than in a service directly administered by Government. But education is so closely implicated with public interests as well as with private conviction that the community, or the Government acting in its behalf, cannot dispense with the right of exercising supervision over the qualifications which each entrant into the profession should be required to possess. We believe, therefore, that the whole body of teachers should *ultimately* be organized by charter as a profession, with a registration council (representing the various bodies and grades of teachers and, in India both Hindu and Muslim teachers) to regulate the conditions of entrance, to grant admission, and to frame and enforce rules of professional conduct. In view of the public interests involved, the sanction of Government should be required to the conditions proposed for admission to the profession and to any statutes or regulations of major importance which the registration council might think expedient to adopt.

28. We conceive that, under such a form of organization, professional *esprit de corps* would be combined with an effective degree of public control; that the unity of national education would be promoted, with due regard to the different qualifications required for service in its various grades; that primary, secondary, technical and university

education would each gain by having its representatives upon a council common to the whole profession and discussing its affairs; that the study of the science and art of education would be promoted by the enforcement of such study as a condition of admission to the profession; and that the teachers' calling as a whole would acquire greater dignity and public consideration and thus become more attractive to men and women of ability and promise.

RECOMMENDATIONS REGARDING THE TRAINING OF TEACHERS.

29. A serious deficiency in the numbers of well-qualified teachers is the fundamental weakness in the system of secondary and intermediate education. It is also the cause of an enormous waste of money and of time. There is urgent need in Bengal for many thousands of well-trained teachers, equipped with a sound knowledge of what they have to teach and with a clear comprehension of the aims and methods of a good school. In particular, the methods of class teaching are at fault; and the corporate life of the schools is inadequately developed for the formation of character. If the teaching were improved the school life of the average high school boy could be shortened by two years.* The amount which parents in Bengal would save by this economy alone would be not less than 15 lakhs of rupees a year, a sum which would be substantial contribution towards the cost of the reform of secondary and intermediate education in the Presidency. In addition to this, improved methods of class teaching in the schools would enable parents to avoid in almost every case the cost of providing private tuition for their sons. The amount of this saving we cannot estimate, but it would be very large. And these economies would accompany an actual advance in the attainments of the boys and a material improvement in their mental vigour and physique.

* The average of candidates for matriculation is now nearly 18½ years. With better teaching it should be 16½ years or lower.

The systematic reform of secondary and intermediate education in Bengal will be greatly reduced by these savings on school fees and on private tuition, apart altogether from the intellectual and physical advantage which it would incidentally secure. One indispensable condition of this reform (another aspect of which is a material improvement in the pay and prospects of the teaching profession) is the better professional training of teachers. In this work the Government and the universities should co-operate.

30. The recommendations which we put forward with a view to meeting these requirements are as follows :—

lx. Seven hundred trained teachers should be sent annually into the secondary and higher secondary institutions. Many of these would be employed in the intermediate colleges. The Universities of Calcutta and Dacca should each furnish annually 100 trained graduate teachers. The remaining five hundred should, after passing the intermediate examination, be trained in training colleges established by Government.

lxi. At each of the two universities there should be a department of education under a professor of education assisted by an adequate staff. Under the direction of the professor there should be a training college, to which should be attached a large practising school and also a small demonstration school; the first to accustom the students in training to the methods which should be used in every good school under normal conditions of work; the second to provide opportunity for educational experiments and for the trial of new methods and courses of instruction. The course of training should in all cases include a prolonged course of practice in teaching. One of the principal aims of these university departments should be to train teachers in the methods of teaching languages (especially English and the mother tongue) and science. They should also (in association with other departments

of the university) be the centres of investigation in educational subjects and for the training of advanced students in the principles and history of education.

lxii. Education should be included as a subject (a) in one of the courses of study at intermediate colleges, and (b) in some of the groups approved for the pass B. A. degree. The professor of education should be held generally responsible for the origination of study in education in the pass degree course and also in the house for the degree of bachelor of teaching. The latter should usually be taken as a second degree, after a course of training extending over one year subsequent to the B. A. or B. Sc. But students who have taken the intermediate courses (including education as one subject) and have subsequently served for two years on the staff of a recognized school should be allowed to proceed direct to the B. T. degree after taking an approved course of instruction, extending over three years, partly in the university departments of arts or science, partly at a training college. For these and other students taking the professional courses for teachers bursaries should be provided on a liberal scale.

lxiii. Any student who has taken the B.T. degree should be allowed to present himself for the examination for the M. A. after a course of instruction extending over two years. The principles and the history of education should be added to the list of subjects in which a candidate may present himself for the M. A. degree.

lxiv. The departments of education in the Universities of Calcutta and Dacca, should arrange courses of public lectures on educational subjects in these cities and at other centres in Bengal.

RECOMMENDATIONS REGARDING ORIENTAL STUDIES.

31. The systematic development and encouragement of oriental studies is one of the most natural and important functions of

an oriental university. But this function has hitherto not been performed in a satisfactory way, partly because the primary function of university work has always hitherto been held to be the development of western learning, and partly because there has been a dislocation of aim between the studies carried on in the university and its colleges, theoretically in accord with western methods, and the traditional studies in the oriental classical tongues which are carried on in the *tol*s (for Sanskrit) and in the *madrassah*s (for Islamic subjects). The history of these organizations and their relations with the system of western training form a very complex and difficult subject, which is fully investigated in Chapter XVI. In the result, while in the Sanskrit College and the *tol*s, and (until recently) in the *Madrassah*s, the purely traditional learning was pursued, the attempts made in the University and its colleges to apply western methods to the study of these subjects has been unsatisfactory. A very substantial advance has been made in the last few years in the higher branches of these subjects (especially Sanskrit and early Indian history); but the work of the colleges, and the training given to the mass of students, still remains far from satisfactory.

32. At the same time in spite of the emphasis laid by Government ever since the time of Macaulay upon the importance of serious study and systematic development of the vernaculars, the study of the mother tongue has been gravely neglected alike in the schools, in the colleges, and in the University; the demand of vernacular knowledge made upon the students being of the most inadequate and perfunctory character. The results of this have been unhappy, since it has involved a neglect of any proper development of the student's natural medium of thought.

33. We consider it to be important (a) that the purely oriental and traditional studies should continue to be pursued in the

Sanskrit College and the *Madrassah*, but that neither these studies, as traditionally pursued, nor the University, would profit by any attempt to bring them under direct university control; they ought to remain distinctly organized; (b) that the development both of the oriental classics and of the vernaculars should receive more systematic attention than has hitherto been given to them and that for this purpose university students ought to have access to the learning of the distinguished *pandits* of the Sanskrit College and *maulvis* of the *Madrassah*, in so far as these are ready and able to help them. Some arrangement is therefore necessary whereby the centres of traditional oriental studies, while remaining distinct and undisturbed, should yet be brought into relation with the universities, while at the same time oriental studies on more modern lines are also cultivated in the universities. An arrangement of this kind seems to be practicable, though, owing to existing differences of organization, there would have to be some variation of treatment in regard to Sanskrit studies on the one hand, and Islamic studies on the other.

34. Our recommendations for dealing with this difficult problem are as follows:—

lxv. The Sanskrit College, Calcutta, should be reorganized in three sections (a) a high school and intermediate college which would take over the work of the present intermediate classes, as well as the 'high' classes of the high school course, but would throughout lay special emphasis upon Sanskrit; (b) a constituent college of the teaching University, arranged to accommodate, say, 500 students; to this college should be attached the university chair of Sanskrit and the chair or readership in Pali, and its students should profit by the instruction of the *pandits* in the neighbouring *tol* department; this college would naturally be the principal centre of teaching in an honours school of Sanskrit; (c) a *tol* department which would work, as now, in connexion

with the Sanskrit Association and have no direct connexion with the University. These three institutions should be housed in separate buildings side by side, on the site of the existing Sanskrit College and the Hindu School; the library should be available for the use of all three. They should have distinct governing bodies, which would be in relation, respectively, with the board of secondary and intermediate education, with the University and with the Sanskrit Association; but care should be taken to ensure that there were common elements in all three governing bodies.

lxvi. Students of the *tol* department of the Sanskrit College, if they pass the title examination, and are adequately qualified in English, should be encouraged to pursue their studies in western aspects of their subjects without going through the high school and intermediate course; and for this purpose the University should institute a diploma, or possibly a degree, for such students, the course of study for which should include such subjects as comparative philology and archæology.

lxvii. In regard to higher Islamic studies, we have already recommended that a department of Islamic studies giving in the first instance degree of B. I. should be organized in the university of Dacca on the lines defined by the original Dacca University committee, as the culmination of the reformed madrassah course, and that the first two years of the proposed course should be conducted in the Dacca Madrassah, and possibly also in one or two other madrassahs; we have further suggested that an alternative or modified course (including elementary science, and more nearly approximating to the proposed courses of the intermediate colleges, while still retaining essential Islamic studies), might be gradually introduced in these madrassahs, and might lead up to a degree of B. A. Islamic studies, treated on modern lines.

lxviii. The Anglo-Persian department of the Calcutta Madrassah should be organized as a distinct high school and intermediate college.

lxix. In Calcutta we have recommended the establishment of an Islamia college as a constituent college of the teaching university; to this college chairs or readerships of Arabic, Persian and Islamic history should be attached and it should become the chief centre of instruction for an honours course in Arabic and Persian. For the purposes of this work, the co-operation of eminent *maulvis* from the Calcutta Madrassah should be invited and course given by them either in the Madrassah or in the Islamia college should be recognized by the university for these purposes.

lxx. Students following the traditional course in Calcutta should be encouraged, without leaving the madrassah, to take up, after passing the senior madrassah examination special courses for a diploma, or possibly a degree, instituted by the university. Part of the instruction for this might be given in the Islamia college.

lxxi. With a view to encouraging a more serious and scientific study of the vernaculars, chairs or readerships in Bengali, Urdu and other vernaculars should be established in the University; and the literature and philology of the vernaculars should be introduced among the subjects which students are permitted to offer both for pass and for honours degrees.

RECOMMENDATIONS REGARDING PROFESSIONAL AND VOCATIONAL TRAINING.

35. We have been deeply impressed by the general disregard among university students in Bengal of the possibility of finding careers in practical—professional and technical—work other than law and (to a less extent) medicine; by the deficiency of opportunities for obtaining training for such careers, and by the consequent overcrowding of courses of purely literary study. This

disregard has its roots in historical and social facts which especially affect the classes from which the bulk of the students are drawn. But it must be amended; and any scheme of educational reform which does not place in the forefront need for such an amendment must fall short of the country's needs.

36. The strong hold which the university and its courses possess upon the minds of the educated classes in Bengal has led to the suggestion that if only the university offers degree courses and examinations in practical and technical subjects the prejudice against careers of this type will be overcome. There is something to be said for this view, and undoubtedly action ought to be taken by the universities, and will have a useful influence upon opinion. But in this sphere even more than in others, it is training above all which is needed and as training is costly and demands elaborate equipment in nearly all vocational subjects no course of study should be defined until there is a responsible assurance that the necessary provision of teaching and equipment is being made. And unfortunate results may follow, and the whole movement towards practical careers suffer a check, if men are turned out in large numbers with an equipment of a kind for which there is very little demand. There is real danger in the idea that, if an examination is provided and a degree course defined, all that is necessary is done.

37. But the provision of courses of study by the University, even on the most adequate scale, is not enough. Degree courses in technical and professional subjects other than those for the established profession of medicine and law, are required by a comparatively restricted number of persons even in highly industrialized countries. The highly trained scientific experts whom the industries of a country can absorb—and it is only with the training of such that a university should be concerned—must always be relatively few in numbers. On the other

hand, industry, especially in a country where it is just entering upon a period of expansion, needs a very large number of men who are intelligent and educated, and whose training has given them some introduction to the sciences at the base of their calling, but who cannot be called scientific experts. The need for such men is probably the greatest need of to-day in Bengal: though the others also are needed. And from this point of view the system of intermediate colleges with their varied course—each with some vocational bias, though still general in character—must be of very great value. They will be of value also in providing students with a more efficient preliminary training, not only for technical courses of study, but also for the old professional courses. They represent, in short, the essential foundation of a new and sounder system of training.

LAW.

38. The system of training in law is of recent institution, and seems to be working well. Nor can it be said that there is such a paucity of lawyers in Bengal as to make it urgent that measures should be taken to increase the supply. In this field, therefore, we have few changes to suggest.

lxxii. In order to ensure a more adequate treatment of the more purely academic branches of legal studies, the Tagore Chair of Law (hitherto devoted to special lectures) should be used to secure the services of a permanent professor in jurisprudence or Roman law; and it would be desirable that other full-time chairs or lectureships should be established if funds become available.

lxxiii. The course for the degree of B. L. should remain a post-graduate course extending over three years. Students should be permitted, during the course of study for a degree in law simultaneously to undertake a course in another faculty. But special care should be taken to exact the full measure of work in both faculties.

lxxiv. The existing law college at Dacca should be developed into a distinct faculty of law organized as a department of the Dacca University. The faculty should include at least one High Court judge together with representatives of other branches of the profession and in order to enable these members to be present at its meetings, it should be empowered to meet, when necessary, in Calcutta.

MEDICINE.

39. The system of medical training provides for two classes of students, those who aim at a university degree, and who are provided for in two colleges, one Government and one private, (both in Calcutta) and those who aim only at the licence granted by the state Medical Faculty of Bengal, and are given a shorter and less elaborate course in institutions attached to hospitals at Calcutta and Dacca and known as medical schools. The demand for admission to the medical colleges and the degree courses is greater than the accommodation. On the other hand, the existing need in Bengal is greatest for medical men who will be willing to practise in the rural districts, which experience show, that graduates are reluctant to do. The provision made for medical training in the Calcutta Medical College seems to us to be sound, though hampered by various difficulties and by the lack of organized teaching in various special subjects. The medical schools also (which are wholly unconnected with the University) are doing useful work, but the course is rather a slight one in some respects, and the gap between the two branches of the profession is too great. We do not, however, suggest any immediate changes in this regard. Our recommendations regarding medical training (in so far as it is affected by our general proposals) are as follows :—

lxxv. The Calcutta Medical College and also (if it is able to fulfil the conditions) the Belgachia Medical College, should become

constituent colleges of the Teaching University.

lxxvi. The standard of entrance to the Medical Faculty, as to other Faculties should in future be that of the proposed intermediate college examination, one form of which should be adapted to the needs of medical students, though entrance should not be restricted to students who have taken the examination in this form.

lxxvii. Training in the preliminary sciences (physics, chemistry, botany and zoology) should be provided as soon as possible elsewhere than in the medical colleges. It may be found possible to afford a sufficient training in selected intermediate colleges. But this could not meet the whole need, and provision should be made in these subjects by the University of Calcutta and its constituent colleges.

lxxviii. Preliminary scientific training for women medical students should be made, if possible, by co-operation among the women's arts colleges, and the scheme of training should hold in view the requirements of the Lady Hardinge Medical College for Women at Delhi, as well as those of the Calcutta University.

lxxix. The principal of the Calcutta Medical College should be paid a salary sufficient to exempt him from the necessity of undertaking private practice.

lxxx. A well equipped department of public health should be established in the Calcutta Medical College. Professorships should be created in this college in (a) pharmacology, (b) mental diseases, (c) dermatology, and syphilology, (d) diseases of the ear, nose and throat; and lectureships in (e) X-rays and (f) electro-therapy. There should also be a chair of the history of medicine; this might be a chair in the University.

lxxxi. In view of the absence or organized and systematic training in dentistry, it is desirable that a department or school-of

dentistry should be established as soon as possible in the Bengal College of Medicine.

lxxxii. A medical college at Dacca, preparing students for degrees in medicine, should be established in due course when adequate arrangements can be made.

lxxxiii. A much needed expansion of medical training of the type given in the medical schools would be facilitated by the use of some of the intermediate colleges to provide the necessary training in the preliminary sciences.

ENGINEERING.

40. The training of skilled engineers is one of the most important services which the universities have to render in an industrial society ; and in view of the coming development of Indian industries it is to-day more important than ever. The Civil Engineering College, Sibpur, has hitherto devoted itself mainly to the production of civil engineers ; but if industrial development proceeds apace, there is likely to be a large and growing demand for mechanical engineers. One of the chief obstacles in the way of this work has hitherto been the aversion of students of the *bhadralok* classes from any avocation involving manual work ; and in this sphere the Engineering College has, in fact, hitherto confined itself to training men for subordinate branches of the profession, and has made no attempt to provide training of a university level. During sixty years the Engineering College has done good work in difficult circumstances ; but in the judgment of the Indian Industrial Commission, as in our own, the time has come for a reconsideration of its range, methods and organization. Our recommendations on this head necessarily overlap those of the Indian Industrial Commission and the Public Works Department Reorganization Committee, with which they should be compared. We add certain recommendations regarding the kindred subjects of mining and architecture.

lxxxiv. The Civil Engineering College, Sibpur, should be a constituent college of the University of Calcutta, and should be placed under the direction of a governing body created by charter. The governing body should include representatives of Government of the teaching body of the college, of the engineering profession and of the industrial interests concerned. It should receive stated annual allocation from Government, and should, subject to audit, be allowed wide latitude in expanding this grant, and in obtaining funds from private sources, especially from the industrial interests served by the college. It should have power to make appointments to the staff and to control the curricula of the college.

lxxxv. The college should gradually devote itself wholly to higher or university work, and the lower or technical classes now accommodated in it, should be provided for elsewhere.

lxxxvi. Training up to the degree standard in mechanical engineering should be given at Sibpur, and the necessary additions to the staff and equipments of the college should be provided for. Training up to the same standard in electrical engineering might also be provided later.

MINING.

lxxxvii. The course of study in mining should be maintained and extended at Sibpur

ARCHITECTURE.

lxxxviii. In view of the absence of organized provision for training in architecture, it is desirable that a scheme of training in this subject, which might lead up to a degree, should be organized in Calcutta. This could probably best be done at Sibpur, possibly with the co-operation of the School of Art.

AGRICULTURE.

41. In spite of the supreme importance of agriculture as the predominant economic interest of Bengal, there has hitherto been no attempt to provide organized instruction

in agriculture of a university grade. Government has maintained a number of experimental farms in the presidency; the agricultural college at Sabour was designed to serve the needs of Bengal as well as Bihar, though, under the terms of the Patna University Act, it is precluded from having any connexion with the University of Calcutta. The method of cultivation and of land-tenure prevalent in Bengal do not lend themselves to any considerable employment of highly qualified scientific experts, such as university graduates in agriculture ought to be. The kind of training for which there is widespread need is of a more elementary kind, and is such as, we hope, may be afforded in the agricultural course we have proposed as an element in some of the intermediate colleges. Nevertheless we are convinced that there is need for the service of a limited number of highly trained men, and that it is the duty of the University to provide them. But since the number of posts likely to be available will, for a long time to come, be very small, and since a man trained as an agricultural expert is apt to be regarded as of no use for any other purpose, we feel that the greatest care should be taken (*a*) not to admit more than a reasonable number of students, and (*b*) to provide for them a scheme of training which would fit them for other cognate occupation should a purely agricultural calling not be available.

42. Our recommendations on this head are as follows:—

lxxxix. There should be a department or school of agriculture in the University of Calcutta organized at first on modest lines, and making use, so far as possible, of existing resources. It should have attached to it a demonstration and experimental farm in the neighbourhood of the city. It should work in close relations with the Government Institute of Agriculture which it is proposed to establish.

xc. If and when provision has been made for teaching in Calcutta for an experimental

farm, and for opportunities of practical training at the proposed institute, the University should establish a degree course suitable for the training of scientific agricultural experts. The first three years of this course should lead up to a special form of the B. Sc. degree. Thus qualified the student should be admitted for a period of one or two years' practical work in the proposed Government Institute of Agriculture; after which, if his work was certified as satisfactory, he should be eligible for the degree of Bachelor of Agriculture.

xc. Until the opportunities of suitable employment expand provision should be made only for a small number of students.

xcii. A more elementary introduction to agricultural science, suitable for zamindars agents, teachers in agricultural districts, officers of co-operative societies, etc., should be given in selected intermediate colleges.

TECHNOLOGICAL SCIENCES.

43. We regard it as an important and indeed a necessary function of a university, situated in a great industrial and commercial city like Calcutta, to include applied science and technology in its courses and to recognize their systematic and practical study by degree and diplomas. This function must not be confused with that of training foremen and other servants of the scientific industries. The latter is the business of technical institutions of another grade, with the work of which the courses of the University should be so far as is necessary correlated. For example, the University of Calcutta, in the development of its courses of training in applied science, should co-operate with the proposed Calcutta Technological Institute, specially in the use of workshops for the practical training of the students. We hope that private benefactors and the industries concerned will give generous help to the University of Calcutta in its new technological departments, which should not be started until the means of providing

adequate courses of scientific and practical instruction are assured. In view of the great expense of providing these courses and of the comparatively small number of scientific experts whom the industries of India are for the present likely to absorb, care should be taken to avoid any wasteful multiplication of institutions giving technological training in the same branch of industry. In this branch of education there should be a division of labour according to the industrial needs of the different provinces of India. While, therefore, independent action on the part of each university should be welcomed when private liberality enables it to develop this side to its work in the interest of the district which it immediately serves; and while the provincial Government should be free to develop technological training for the assistance of any industry which it regards as important or promising; the Government of India should have an organization (as is proposed by the Indian Industrial Commission) for giving guidance and advice in this matter from all-India standpoint, and should administer funds out of which it may give special grants-in-aid to advanced technological training and research at the universities and elsewhere. The Government of India will thus be in a position to exert considerable influence in securing concerted action among the universities in regard to technological training.

44. Our further recommendations are as follows:—

xciii. Calcutta is a suitable centre for the advanced training of students to meet the needs of the leather industries, the chemical industries (including dyeing), the oil and fat industries and some branches of the textile industries. In several of these departments, the work of the university technological laboratories should be associated with that of the engineering college at Sibpur. So far as possible, the university departments of

technology and applied science, should be placed in the neighbourhood of the university Colleges of Science, should be attached to it administratively and should come under the general supervision of its governing body. To each department of technological study there should be attached an advisory committee which should include leading representatives of the industries concerned. Within defined limits the principal university teachers in the technological departments should be permitted to engage in private practice.

xciv. At Dacca the intermediate college should provide scientific and practical instruction preparatory to engineering and agriculture; and the technological research work entrusted to the scientific laboratories of the university should be co-ordinated as far as possible with corresponding investigations conducted in the university laboratories in Calcutta.

xcv. The reform of the intermediate courses is necessary for the development of a general scheme technological training; and the new intermediate colleges should therefore be established as quickly as possible, because their work will serve as a foundation for the university.

COMMERCE.

45. In the training of students for a commercial career the university has a very important but limited function. In all countries the vast majority of those who go into commerce do so at an earlier age than that of graduation at the university. It is at this earlier age, therefore, that preliminary training for commerce can be most usefully given. For this among other reasons we have recommended the reform of the high schools. Bengal needs modern secondary education. The high school certificate, which a boy will gain after receiving a good general education up to sixteen or seventeen years of age, will be a valuable credential to those who wish to

enter upon commercial life immediately after leaving school. But even more useful as a preparation for business will be the training given at the intermediate colleges. We have recommended that these colleges which provide a practical but not narrowly specialized course which will give an excellent training to young men who intend to enter commercial life at eighteen or nineteen years of age. In addition to this we propose that there should be classes in commercial subjects at technical or commercial institutes aided by the department of public instruction and the department of industries. Many of these classes should be held in the early morning or in the evening after office hours. Lastly there is need for advanced teaching in banking, insurance, actuarial science and other subjects bearing upon the commercial interests of the country. In this, the university should take an increasingly important part.

46. It is necessary to guard against the idea that a specialized commercial degree course at a university is likely to be found by any large number of students an *open sesame* to well paid and responsible employment by business firms. The ordinary student, after taking as an undergraduate a degree course in commerce, would find himself handicapped by beginning his commercial career some years later. His difficulties would be the greater if he had acquired inappropriate habits of work, and if he resented having to begin at the bottom of the ladder, below many junior to himself in age. A university cannot teach the practical side of business. A degree in commerce does not necessarily connote commercial aptitude. That must be tested and developed in the office and the counting house. And (save in very exceptional cases) this test must be applied under the ordinary conditions of commercial employment. Part-time attendance at an office, however ingeniously dovetailed into a full undergraduate course, cannot be so organized as to provide for any

large number of students an all-round practical training in business methods. Even less practical would it be for the university to examine the work done by the student in the office of a business house, and to pronounce upon its value as part of the qualification for a degree.

47. Nevertheless the university can give a useful training in the science which lie at the basis of commerce. But the students who undertake such a course for their degree must be prepared to recognize the fact that when at last they enter upon employment in a business house, they will have to start upon the same terms as those offered to youths much younger than themselves and not possessing a university degree. They must face the fact that they will have to trust for their promotion to their own ability and trained capacity, not to the academic title which they possess. For students of a special type a degree course in commerce at the university may be an admirable preparation for a business career. But students of this type are not very numerous.

48. Our further recommendations regarding university courses in commerce are as follows:—

xcvi. The University of Calcutta should have power to institute, when it thinks fit, a Faculty of Economics and Commerce and to confer degrees and diplomas in commercial subjects. An advisory committee on higher commercial education should be attached to the department of economics.

xcvii. The University should be prepared to provide courses of instruction in banking, accountancy, insurance, actuarial science, industrial history, etc., designed especially for students who are already engaged in business, and at hours convenient for their attendance. Admission to these courses should not be limited to persons who have passed the entrance examination of the university.

MEDIUM OF INSTRUCTION.

49. We have analyzed the great mass of evidence on the medium of instruction and have shown that the divergent views expressed cut across the divisions of race, religion, nationality and occupation.

We have dealt with the psychological problems of mind-training involved in the use of the mother tongue and of the English medium and have suggested that the educated public of Bengal, like many other countries within the British dominions and elsewhere, will probably wish to be bilingual. We regard reform both in the teaching of the vernacular, which should be placed on a scientific basis, and in the teaching of English, as essential, and we have made *inter alia* the following recommendations:—

xcviii. The vernacular should be used in general throughout the high schools, except for the teaching of English and of Mathematics, which, during the last four years of the course, should be conducted in English.

xcix. At the 'high school examination' (corresponding to the matriculation) candidates should be permitted to answer either in the vernacular or in English, except in the subjects of English and of mathematics in which English should be compulsory.

xe. The medium of instruction and examination in the intermediate colleges and university should be English (except in dealing with the vernacular and the classical languages.)

ci. Phonetic methods should be employed in the teaching of spoken English and there should be a *viva voce* test in English both at the intermediate college examination, and at the university examination in that subject.

cii. In the university a distinction should be made between the teaching of English for practical and for literary purposes; teaching of both kinds should be available for all students; but a uniform course in

English literature should not be a compulsory examination subject for all students in the Faculty of Arts.

ciii. The scientific study of a vernacular should be encouraged in the university.

civ. To relieve Muslim students from an excessive burden of languages study, Musalmans offering Bengali as a vernacular should be permitted to take Urdu in certain examinations in the place of a classical language.

EXAMINATIONS.

50. We have pointed out that the examination system of Calcutta is probably the largest university examination system in the world. In 1918 the university examined nearly 32,000 candidates.

51. We have analyzed the comprehensive evidence dealing with this system, by which education in Bengal is now dominated.

We have pointed out that the university degree is practically the only portal at present to all careers in Bengal and hence that examination reform is a necessary condition for the reform of education. Apparently unimportant details of the examination system profoundly influence the preparation of the students. Thus the mechanical system of marking devised to secure uniformity of treatment encourages pure memorisation at the expense of intelligence and lends to the deterioration of mental efficiency throughout the schools and the university. We have suggested that the purpose of the various examinations should be more clearly defined, that the examinations should be both designed and conducted with such purpose clearly in mind. We have made a number of specific recommendations in regard to the conduct of examinations; but we think that the adaptation of examinations to their purpose and their conduct on rational principles cannot be carried out by mere regulations but must be left to the future university authorities as an important part of their duties. We hope that the boards of examination recommended by us will serve as

the auditors of the examination system and as the conscience of the universities in this matter; they will publish typical specimens of complete examination answers from time to time and constantly bring before the universities proposals for the removal of defects in the examination system and for the introduction of new and improved methods. We also have hopes that certain subjects may be studied by students without their being required to submit themselves to any examination therein, so that a portion of the curriculum may be entirely freed from examination pressure.

The universities should also welcome at certain of their courses, where accommodation allows, members of the general public qualified to profit by it. Such auditors would be subject to the ordinary university regulations and would pay a suitable fee.

52. Amongst our recommendations of detail are the following :—

cv. In order to maintain continuous watchfulness upon the methods and use of examinations, to ensure that they are not so mechanically conducted as to exercise a harmful influence upon teaching and study, and to make certain that the purposes with which each examination is devised are held in view, and are fairly realised, there should be in each university a small board of examinations, whose functions should not be executive but primarily those of criticism and suggestions.

TRANSITIONAL MEASURES.

53. The reforms which we have proposed are of a fundamental character, both from the point of view of administration and of education *per se*. We have made it clear that we think the educational reform which we regard as necessary cannot be carried out without the administrative reforms. But the questions may be raised as to whether it is necessary or possible to carry out the whole of the administrative changes simultaneously. In our view, such simultaneous changes are both desirable and

feasible provided that the funds required are available and provided also that there is a sufficient *personnel* available to carry out the heavy work of the period of transition.

54. The changes fall into three main categories: (1) change in secondary and higher secondary education, involving the setting up of the Board of Secondary and Intermediate Education; (2) the creation of the University of Dacca; (3) the reconstitution of the teaching university in Calcutta and the establishment of a new organization for the mofussil colleges.

55. We have said that these changes could be effected simultaneously, but we do not wish that term to be interpreted too strictly. We have borne in mind that in a large class of legislative measures it is found both convenient and necessary to allow a preparatory period to elapse between the passing of an Act and the appointed day on which it comes into force; and that in the case of a complex measure it may be desirable to make different portions of it come into force on different days; and even to allow of by further elasticity remitting the fixing of such 'appointed day' (within limits defined by the Act) to a specified administrative authority. When we say that the administrative changes should take place simultaneously we mean that they should be authorized by a single Act, or by one or more Acts passed simultaneously, and that the 'appointed days' fixed in, or authorized by, those Acts should be reasonably close to one another.

56. We think it possible, however, that both for financial and for administrative reasons Government might desire the transition to be spread over a longer period than that which we have contemplated, and that we ought therefore to indicate the order in which the three changes proposed should be carried out.

57. We think there can be no reason for delay in setting up the Board of Secondary and Intermediate Education and in making provision for the reform of secondary and intermediate education, which, as we have said repeatedly, we regard as the very pivot of the whole reform.

58. We have also urged that there should be no further delay in creating the University of Dacca. It is unnecessary to advance further arguments on either of these points.

59. But the case of the University of Calcutta is different and more complex. Apart from any financial and administrative difficulties which might be felt by Government in introducing immediate changes, it may be urged with some reason that the university should not be reconstituted until the new intermediate system comes into working order.

60. But if the Secondary and Intermediate board and the University of Dacca are created, at once, while the reconstitution of the University of Calcutta is postponed, that postponement may take place in three different ways, which give rise to three very different situations.

(a) The legislation for the reconstitution of the University of Calcutta might be postponed purely and simply, the Government of India limiting themselves to a statement of their intention in regard to university policy. But such postponement could not leave the Universities Act and the constitution of the University of Calcutta entirely untouched; for although the University of Dacca might be created (as was the University of Patna) without direct amendment of the Universities Act, we think some direct amendment would be necessary to provide for the transfer of the power of recognizing high schools

and intermediate courses from the University of Calcutta to the Board of Secondary and Intermediate Education. Such amendment would probably give rise to immediate difficulties. For it would not be easy to limit the amendment of the Act to this single point. Government would inevitably have pressed on it with reason, a number of minor amendments, it might find itself involved in controversy on innumerable points of detail; and yet reforms of detail, desirable in themselves, might, if carried out, only block the way to fundamental reform and make the eventual task of the legislature more onerous. Even more serious, perhaps, is another objection. The colleges would find their arrangements upset by the removal of their intermediate students without finding any authority in position to give them either definite assurances as to their future, or assistance in making the necessary provision for their higher work. Thus there would ensue a trying period of uncertainty and unrest with few compensating advantages.

We think it clear, therefore, that the amendment of the Universities Act should not be made piece-meals but that Government should decide forthwith on its university policy as a whole.

But such a decision would still leave open two plans, (b) and (c) below, for bringing that policy gradually into operation.

(b) The Act reconstituting the University of Calcutta might be passed simultaneously with the legislation bringing into existence the University of Dacca and the

Board of Secondary and Intermediate Education; but the entire operation of the Act other than that relating to secondary and intermediate education might be suspended for some years. This procedure would obviate the disadvantages of piece-meal legislation, and would create a more clearly defined situation. During the period before reconstitution a good deal might no doubt be done by Government and by the University, especially if it had a salaried whole-time Vice-Chancellor, to prepare for the new order of things. But it may be doubted whether the existing organization could be expected to carry out such preparations with enthusiasms; and we fear that this arrangement would not lighten the labours of the Executive Commission, the appointment of which (though deferred for a time) would ultimately be as necessary as if the University were reconstituted at once.

- (c) The third course which we regard as possible would bring the Executive Commission into existence simultaneously with the Board of Secondary and Intermediate Education and the University of Dacca; but the Executive Commission would have more limited powers than those which we have prepared in Chapter XXXVII, and the present Syndicate and Senate would be left to carry on the routine business of the University during a preparatory period. The Executive Commission would negotiate with the colleges in regard to their needs under the new system; it would advise

Government in regard to necessary grants for the colleges and for the creation of fresh teaching on the lines indicated in our recommendations; it would deal with the great problems of the residence and health of students and with the provision of sites for hostels; and finally it would advise Government as to the best date for bringing the Act into complete operation. Very soon after that date it ought to be possible for the Commission to transfer its powers completely to the new governing bodies of the University.

61. Like the other schemes for postponement this would spread the financial liabilities of the Government over a longer period, and would diminish the pressure of the change both upon the administrative officials of Government and upon the Executive Commission itself. The chief objection that we anticipate to the scheme is that there might be friction between the Executive Commission and the older university authorities. But the University Act would necessarily delimit the powers of the Commission and of those authorities in such a way as to prevent formal clashing; and we hope that in more informal matters friction might be avoided by the presence of the Vice-Chancellor and of other members common to the Executive Commission and to the Syndicate.

62. We may point out, that if, contrary to our expectations, the University of Calcutta is reconstituted before the creation of the Board of Secondary and Intermediate Education, it will be necessary to set up within the University provisional machinery to deal with the schools.

63. We desire to make it clear that certain reforms in the University of Calcutta ought not to be postponed whatever scheme be adopted; namely, the provision of further

residential accommodation; the provision of a teacher's training department and a department of education; the provision of additional accommodation for teaching; and the provision of measures for supervising and improving the health of the students.

MYSORE UNIVERSITY.

The following extract relating to the Mysore University is taken from the Report:—

One outstanding instance of a new type of university appealing to local patriotism is presented by the University of Mysore, which includes the Colleges at Mysore, and Bangalore, the former devoted to arts, and the latter to science teaching. We visited Mysore and Bangalore at the invitation of His Highness the Maharaja of Mysore and discussed the future of the new university not only with His Highness, but also with the Dewan, the Vice-Chancellor, the Registrar and the members of the teaching staff. The movement for the creation of the new university originated in a healthy desire to break new ground, especially in two directions. In the first place the work of the first year of the old college course is to be conducted in a few specially selected high schools. In the second place though to the regret of some of the founders, it was not found possible to establish the University in a single seat, collegiate instruction, instead of being widely dispersed is concentrated in Mysore and Bangalore. The question whether these centres should ultimately form two separate universities being left to future experience to decide. We believe that the foundations of the new University have been truly laid and that school boys and college students alike will benefit by the new departure.

ECONOMICS IN THE WEST.

The Coal Controversy.

London, 18th July, 1919.—We are at the present time passing through a serious crisis in the coal industry—indeed in the entire industry of the country. Last week in the House of Commons the Government dropped a veritable moral bombshell by announcing that owing to the falling off of coal production consequent upon the Sankey award it would be necessary immediately to increase the price of coal by six shillings per ton. The effect upon the country was instantaneous. From one end of it to another went up a cry of alarm and indignation. Industrialists especially were moved by what they regarded—and rightly regarded—as a step pregnant with disastrous consequences for the future of industry. Since then there has been a debate in the House of Commons terminating in the conclusion of an arrangement by which the advance is postponed for three months in the hope that increased production at the mines may render it unnecessary. There is a hope that now that the eyes of the nation are opened to the consequences of the enormous enhancement that has taken place in the price of coal, largely as a result of phenomenal advances in wages associated with the adoption of shorter hours of work, there will be a change for the better in production. But it has to be confessed that the signs of improvement are difficult to see in the present conditions of industry and especially of the coal industry. At the present time the most popular miners' leaders are avowed revolutionaries who are far more intent on pushing their subversive views than in promoting the general good of the community.

India, it is scarcely necessary to point out, is deeply interested as a coal producing and steel manufacturing country in this

question of the home production of coal. If, as is unquestionably the case, the present price of home produced coal is so high as to make export of the commodity impossible to many parts of the world which have hitherto relied almost exclusively on British coal an opening is furnished for the promising

dian coal trade such as a few years since could not have been dreamed of by the most sanguine. In this connection some figures supplied to the House of Commons by the Board of Trade, are worth careful study. It was officially stated that while the average price of coal per ton at the pit head was 29s. 4d. in Great Britain (outside Scotland) it was only 5s. 10d. in India in 1918. This rate for India was the lowest price given in regard to any country but the Transvaal where coal is raised for 5s. 6d. per ton. But the Transvaal coal is a negligible factor and in any case cannot be of much account in the world competition because of the heavy expense involved in railling it to a sea port for shipment. In the future, therefore, it is reasonable to look for a very great extension of the Indian coal trade. Certainly in the markets East of Suez it should have a very fine chance. And cheap coal implies cheap steel, so that in this direction also there should be a good time coming for Indian industry.

The coal controversy has ramified into many interesting channels, notably into a discussion as to how coal can be conserved in manufacturing processes. On this point Sir Robert Hadfield, a great Sheffield magnate, who is one of the Vice-presidents of the Federation of British Industries, had some instructive things to say to an interviewer the other day. The text upon which Sir Robert Hadfield spoke was the present wasteful use of coal. His view was that with proper furnaces and a scientific system of stoking consumption might be enormously reduced. He cited the case of his own firm, one of the greatest steel manufacturing concerns in the country,

which at the beginning of the war used 15 cwt. of coal to heat a ton of steel, but which by the introduction of "Wincott" furnaces and other means was able to reduce the consumption of coal to 2 cwt. per ton of steel heated. In nearly all ways, according to this authority, the present methods of using coal are wasteful. The generation of electricity, for example, which at present is carried out by some 600 authorities should be the work of one central authority controlling a few big generating stations. By this means there would, in Sir Robert Hadfield's opinion, be a saving of 55,000,000 tons of coal annually. Summing up, he added that the present coal consumption would, if economically used, produce three times the amount of power. The statement is more cheerful than most we have had in connection with the controversy. And the fact that it comes from an acknowledged expert lends it weight.

A HIGH COMMISSIONER FOR INDIA.

No feature of the report of Lord Crewe's Committee on the Home administration for Indian affairs recently published has existed more attention in business quarters than the proposal to transfer the agency work of the India Office to a High Commissioner in India. If the proposal is adopted there will necessarily be a great change in the entire method of dealing with India from the industrial standpoint. At present the agency work is largely if not entirely concerned with the provision of stores, and that though a function of enormous importance only very partially covers the field of action open to a department intelligently directing the interests of India in this country. What seems to be desirable is a system analagous to that of the other Dominions where the advancement of the interests of trade is a definite and important part of the functions of the High Commissioner's Department. One notable direction in which there is an opening for India is the creation of a centre

like those associated with the various Dominions and colonies in which the characteristic productions of India might be exposed to public view. Some of the older Anglo-Indian officials may be horrified at the idea of descending to the shop window to advertise India's status among producing nations; but that will not be the general view. These are days of publicity and no country can afford to ignore the most potent means of bringing home to the man in the street the character of its resources. Apart from this consideration no more valuable agency than a well equipped centre in the heart of London could be devised for educating people on Indian affairs. The ignorance of the average home staying Briton on most matters affecting India is lamentable and if it can be removed immense good will result to both countries.

WOMAN'S PART IN THE WAR.

Woman's part in the war has been a remarkable one and in no direction has it been more fruitful than in industry. This fact, frequently demonstrated, was brought out with particular force in some statements made by Lady Parsons, wife of Sir Charles Parsons, the eminent engineer of turbine fame, at a meeting of the north East Coast Institution of Engineers at a recent meeting held to confer honorary fellowships on Sir David Beatty and Sir Douglas Haig. Lady Parsons in the course of her speech condemned the tendency among engineers "to consider that women were capable only of repetition work on fool proof machines." Quite a large number, she said, were able to set and grind their own tools, and a few could set up their job from drawings. In a firm of gun repairers two girls dealt with guns varying from the 13 inch naval gun weighing 50 tons to the 6lb. tank gun. They could design repairs and calculate the factor of safety of a damaged gun by logarithms and slide rule. Binoculars were being entirely made by women. In fact, women

were able to work on almost every known operation in engineering. About one and a half million women, she added, had received training in schools that had cost the country £ 30,000,000. A wonderful record truly and one which should leave a permanent mark on British industry. But we hear rather ominous accounts of the attitude of the Trade Unions towards women workers. The Trade Unionists are all for equality when it is a question of woman's admission to the professions, but it is quite another matter when she seeks to take her place by the side of men in the workshops.

CO-OPERATION IN INDIA.

Mr. Henry Wolff's work on Co-operation in India recently published by Messrs. Thacker & Co., comes in for a very discriminating and interesting article in the *Times Literary Supplement*. The writer after describing Mr. Wolff as "the Nestor of Co-operative Credit in the English speaking world" and mentioning that though he has never been able to visit India he yet has kept in remarkably close touch with the workers there, examines his book with sympathetic insight. Dealing with his main thesis that the chief danger to the movement in India is excessive bureaucratic control the reviewer agrees with him. Indeed, he goes further than the author and expresses the opinion that Mr. Wolff has understated the risk owing to an entirely pardonable failure to realize the strength of the forces which make for bureaucracy in Indian life. "In the sub-conscious mentality of the people," the writer says, "bureaucracy holds the place which self government occupies with us; it is the national and traditional way of doing things, as familiar to Asoka to Akbar; and when Indians of to-day organize a commercial or even a philanthropical undertaking its familiar features appear with monotonous iteration." Under the new conditions, however, the English influence is destined to be reduced, and Mr.

Wolff's proposals for the future are commended by the reviewer. "The tutelage of the movement must be transferred as soon as possible to unofficial control, and with this object the voluntary workers must be organized so as to form a body competent to take over gradually the work of propaganda and supervision. The Registrars will then be confined to such official duties as are performed by the corresponding officers in other countries, and will be under no temptation to undertake those functions which at present almost compel them to formalise and officialise." The reviewer while giving his verdict in favour of Mr. Wolff's opinions thinks that even under Indian conditions an unofficial body may develop bureaucratic tendencies. Indeed his greatest anxiety is "lest the Indian co-operative movement, the best hope for the economic salvation of the country, should be depleted under the influence of those sub-conscious tendencies" of which he had written. Both the book and the review are notable as an example of the manner in which the economic interests of India are pushing themselves into prominence in this era of reconstruction.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

RADIO NOVELTIES BORN OF THE WAR.

Washington, D. C., U. S. A., 20th June, 1919.—From the amateur radio standpoint the war has contributed a number of interesting and important innovations. Not the least important of these is the wide application of the vacuum tube which, although employed only by the more progressive amateurs prior to the war, is now extensively used for transmitting as well as receiving. The vacuum is nothing more than an electric lamp of the incandescent type, containing one or more electrodes in addition to the filament. Due to the heated condition of the vacuum existing in this special lamp or tube, certain remarkable characteristics result, and these have been applied to radio communication. Thus vacuum tubes are employed for detecting the weak currents induced in the receiving set by the distant transmitter, for building up or amplifying these weak currents in the event that they are too weak to be heard in the receivers after passing through a single vacuum tube serving as a so-called detector, for generating high-frequency currents used in transmitting wireless telegraph or telephone messages, and for modulating powerful currents by means of relatively weak currents.

Vacuum tubes are so much more sensitive for receiving purposes than the former crystal and other types of detectors that most American amateurs will use nothing else. At least, an amateur may start with the far simpler instruments for receiving, but sooner or later he comes around to the vacuum tube receiver, just as the man who starts with a \$500 automobile often climbs by easy stages to the \$2,500 car. The simple receiving set, costing but a few dollars, may serve quite satisfactorily for receiving messages from nearby

stations. However, when the amateur wishes to keep pace with other amateurs who are in daily touch with European and South American stations, he must purchase the very best apparatus for the purpose.

The vacuum tubes have made wireless telephony practicable and relatively inexpensive. Heretofore, the continuous waves required for wireless telephony were usually generated by an electric arc, with all its attendant troubles such as heavy current consumption, flickering, fluctuating oscillations, microphone troubles, and so on. Today, thanks to the vacuum tubes available, wireless telephony comes well within the reach of the average amateur all over the world. A simple vacuum tube may be used together with some form of inductance, capacity, simple microphone, motor generator set for supplying a high-voltage direct current, and other accessories, for transmitting fifty miles. Larger tubes give relatively longer ranges. At any rate, it now becomes possible for the enthusiastic amateur to install a wireless set on his automobile or elsewhere, so that he can keep in touch with his home or office and with other stations.

THE NEWLY-INVENTED GEOPHONE.

The geophone is a unique listening device just perfected by the United States Bureau of Mines as an aid to locating miners who have been entombed and for similar purposes.

Observations made in a metal mine showed that direction can be determined much more easily in rock than in coal. This has been found to be due to the fact that there is some reverberation to the sound of a hammer blow on the coal, while on the stone the sound is "clean cut." Experiments show that pounding with a hammer on solid limestone can be heard from a distance of from eight to fourteen hundred feet, and on gneiss rock from six hundred to one thousand, while the sound was almost completely cut off under all conditions by the interposition of a clay seam one hundred and fifty feet thick.

The geophone, though small, is essentially a seismograph, since it works on the same principle as the ponderous apparatus with which earthquake tremors are recorded. It consists of an iron ring about three and one-half inches in diameter, within the center of which is suspended a lead disc which is fastened by a single bolt through two mica discs, one of which covers the top and the other the bottom of the ring. There are two cap pieces, the top one having an opening in the center to which is fastened a rubber tube leading to a stethoscope ear-piece. These cap pieces are fastened with bolts to the iron ring and serve also to hold the mica discs in place.

We then have really nothing but a lead weight suspended between two mica discs cutting across a small air-tight box. If the instrument is placed on the ground and any one is pounding or digging in the vicinity, energy is transmitted as wave motion to the earth, and the earth-waves shake the geophone case. The lead weight, on account of its mass and because it is suspended between the mica discs, remains motionless, or comparatively so. There then is produced a relative motion between the instrument case and the lead weight. The result is that a compression and rarification of the air in the instrument takes place. Since the rubber tube leading to the stethoscopic ear-piece is connected within this space in the geophone this rarification and compression is carried to the ear drum. Usually two instruments are used, one for each ear.

NEW METHODS OF TESTING LUBRICATING OILS.

To find if an oil contains certain solid impurities, add kerosene to half a cup of the oil until the mixture becomes quite thin. This thin fluid is now passed through filter paper or ordinary colorless blotting paper. As soon as all of the thinned oil has passed through the blotting paper or filter is washed with kerosene. The residue that remains, if there is

any, will show whether the oil contains any solid impurities. Impurities of this kind may also be determined in a coarse way by smearing a piece of common correspondence or pad paper with the suspected oil and holding it against the light. If the oil is free from solid impurities the blot of oil will be equally transparent everywhere. If not, the solid particles of sediment will be plainly visible.

To test whether an oil becomes resinous or not, it must be poured in a shallow dish, and it is then to be left for about a week in some warm place. If at the end of this period there is not the slightest evidence of a crust you may consider the lubricant to be all right.

These oils may also be tested by mixing them with nitric acid. If the oil is pure a thick mass will form in a few hours. Oils that resinify do not thus clot, but remain very thin.

Among other impurities in oils are to be found injurious acids. When acids occur in lubricating oils they destroy the parts of the machines and other apparatus they lubricate much more quickly than should be the case. A test for such impurities is found in mixing the lubricating oils with copper oxide or copper ash. These are added to the oil in a glass container, when, if the oil is free from acid, it retains its original color. If acids are present their action on the copper makes the color greenish or bluish. This test may also be made by dropping the oil on a sheet of copper or brass. Here it should be left for a week, when at the end of that time if the acid be present, a greenish discoloration will be seen on the metal. Almost any of the chemical tests for acid, as with colored solutions and litmus paper, will indicate the occurrence of acid. Litmus paper turns pink in the presence of acid. In its absence a blue color will be apparent.

A "rough and ready" method to compare the lubricating values of several oils is a few drops placed on a smooth, slightly-inclined

metal or glass sheet. Naturally, the lighter oils will reach the bottom first, and should be used on high-speed bearings.

AN INDOOR JACK FOR HEAVY WORK.

For quick action in shifting cars or trucks about in the garage, show room, service station, tire shop, etc., there is real need of a strong, compact, easily operated, quick acting jack that will both lift and transport. For this purpose there has just been invented a jack with a big advantage in these connections; the length over all is but forty inches, which enables the implement to be manipulated to good effect in cramped quarters.

Another distinctive feature is that the wheels of the jack pivot are guided and controlled by the handle. By being able to cut the wheels to right and left it is possible to gain a degree of quick handling and accommodation in crowded spaces which even the short construction of the jack alone, would be powerless to give. This applies either to the manipulation of the jack alone, or of the jack when supporting a car.

The leverage is sufficient to lift 5,000 pounds with ease. The ratchet has a range enabling any car to be lifted high enough for any purpose with at most two strokes of the handle. The quick release latch provides for the rapid return to minimum height.

The jack is so designed that the weight of the load cannot throw the handle violently against the car. Although the handle is free and can be held in any desired position when the load is not being lifted or lowered, a light tension balance draws it, when under a load, into a perpendicular position which prevents it from protruding parallel to the floor.

EXPERT DESCRIBES CAUSE OF AUTOMOBILE DAMAGES.

Every automobile owner at one time or another has had occasion to study a repair bill for replacement of broken or injured parts; and more than once, probably endeavored to show the manufacturer that the failure was due to "poor materials." When a part breaks for no apparent reason the owner in

most cases comes to the conclusion that the material was poor.

A recent case of axle trouble will illustrate the point. An owner broke five differential ring gears in succession and not one lasted more than six months, three of them only a few hundred miles.

This owner insisted that the gear material was of an inferior grade and promptly told the car maker so: but an investigation showed that the ring gear was not running true, and that there was point of contact of teeth. Even the strongest nickel steel gear might break down under such conditions.

It is quite true that many parts—such as axle shafts, motor supports, crank shafts, pistons, etc.—may break if the material is of poor quality, but in the majority of cases even the poorest grade of metal for that particular part will stand up for a long period. The design of the part has as much to do with the breakage as the material from which it is made, assuming, of course, that proper lubricating conditions are maintained.

It may be difficult for the owner of an automobile to understand why tool marks on an axle shaft cause breakage; but as a matter of fact this may actually be the case. Tool marks on a bearing surface are exactly like having a few high spots to take the wear and strain.

A highly polished surface has a greater area of contact than an unfinished surface, hence it will not wear so much and can stand up for a longer period.

Closely allied with tool marks as a cause of breakage comes a design error which employs sharp corners instead of rounded corners. If you will look at the wheel spindle of your car you may notice that its innermost end is rounded off instead of squared off. Where it is squared off the chance of breakage is much greater.

The accurate finishing of parts and the rounding of corners all take time and cost money, and hence it is not usual to find this

carried out to a great extent on any but high grade cars.

Vibration is another common cause of failure. Crank shafts perhaps more than any other part receive a great deal of vibration because of the various forces acting on this part, and the speed at which it runs. In some cars which habitually misfire this vibration becomes greater and the chances for breakage are increased.

If the shaft is too small and is not well designed in so far as its balance is concerned it may break in a very short time. Even the heaviest crank shaft, however, made twice as thick as usual, and made of superior materials, may break more easily than a shaft if attention is not paid to balance.

Some say that internal stresses break the shaft. It is not easy for the owner to understand how a heavy and apparently stiff piece of high grade metal can bend and twist all out of shape, due to vibration and unbalance, but such is actually the case in the engine crank shaft. If you will remember that even slight hand pressure on a table or even on a stone wall causes a slight (though not measureable) compression it will be easy to see how the many tons of pressure to which a crank-shaft is subjected at times may cause the shaft to bend out of shape.

There is another cause of failure in parts—namely, that due to a weak section or use of too little metal. Every time a hole is bored in a piece of metal it weakens it just that much. The more metal the stronger the part. Some cars have parts so small in section, or thickness, at places that they soon break at that weak spot. Where small sections are used for lightness the maker must resort to the use of better quality material and better finish of the part.

Where two surfaces are supposed to rub they must be as smooth as glass and fitted so that they rub all over. If only a portion rubs, then that small portion takes the strain and that which does not rub does no work.

MERCHANDISE DELIVERIES BY
AIRPLANE.

At last the anticipated has materialized. Several of the larger department stores in the eastern cities of the United States are successfully carrying on deliveries of goods by airplane. These aerial delivery systems are now being used to deliver purchases at the various summer resorts on the Atlantic coast. They are the first business houses in the world to actually employ the airplane for strictly utilitarian purposes—the delivery of merchandise from store to customer.

The planes used have special arrangements and facilities for carrying parcels. In the fore cockpit there is ample space for about 400 pounds of merchandise, safely stowed away and protected from the elements. The airplane trips are made on regular schedule time three times a week. At present four airplanes and six pilots are always available.

These airplanes also carry mail from New York, and Newark to Asbury Park, Atlantic City and other coast points. They are the first private enterprise to carry mail by air routes. In this way the government, through the Postoffice Department, is co-operating with commercial enterprises in the endeavor to encourage public interest in aeronautics.

Some of the larger stores are contemplating using "Blimps" for carrying extensive cargoes considerable distances, as soon as these are commercially available. All of the commercial airplanes now in use and to be utilized in future will be magneto equipped.

Regular government mails are already being carried from Boston, New York and Philadelphia as far west as Chicago and St. Louis, and plants are now nearly completed for extending this service into the northwest as far as St. Paul and Minneapolis. It is freely predicted that within a year the mails will be transported between New York and San Francisco by airplane, landing places enroute having already been selected.

ALFRED T. MARKS.

NOTES.

We published in this issue an article based on the Canadian Bureau of Statistics Report on the pulp and paper industries of Canada. In the two years between 1915 and 1917, the value of the production of Canada's pulp and paper mills grew from \$ 40,348,001 to \$ 96,340,327, or by 140 per cent. In the same period the consumption of pulp wood increased from 1,405,836 to 2,104,334 cords. The capital invested in 1917 amounted to \$ 186,787,405. Here is an object lesson for us in Mysore, where we have been talking of a pulp and paper mill for over three years now.

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A new journal of interest is the *British and Continental Margarine and Allied Trades Journal*. It is a live journal and is well written. The Overseas' Causerie, is we think, written by a person who knows what he is about. It is full of informed criticism and timely suggestion. We wish our contemporary every success.

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In connection with the article on Mica Mines in Southern India we published in the *Journal* some time back, the report drawn up by Mr. G. A. Tipper, Assistant Superintendent, Geological Survey of India, published in this issue will be read with interest. The Madras Government state that the Director of the Indian Geological Survey agrees with the conclusions and recommendations contained in Mr. Tipper's report.

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Among coming universities are those of Travancore, Baroda and Indore.

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A parsi gentleman has just left a legacy of fifteen lakhs of rupees to the members of his own community. The interest on the amount is to be used for educational purposes, such as

scholarships to students for study in Japan, America and England.

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At the sixth meeting of the Education Section of the Board of Industries, held on 6th August, at Lucknow, the following among other matters were dealt with. A number of resolutions passed by the Advisory Committee of the School of Arts and Crafts were disposed of including the proposal to establish an Architectural class and a book-binding class and the linking up of the new Jewellery and Metal working class with electric power all of which were approved. The Board recommended the construction of a hostel for Indian students and quarters for the Vice-Principal at the Technical School, Lucknow. The question of the appointment of a whole time Principal for the Dyeing School was considered and a candidate was selected and recommended for the post. The Board also recorded orders of Government sanctioning the establishment of peripatetic weaving schools at Benares and Mau District Azamgarh, and of a Leather Working School at Meerut, the opening of a class at the Technical School, Lucknow, to continue provisionally for a year for the training of disabled soldiers in motor driving. It also expressed its appreciation at the award of a number of additional scholarships to the value of Rs. 10 and Rs. 5 in the mechanical classes at the Technical schools, Lucknow and Gorakhpur.

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Information on the progress of the sisal industry has been published in the *Ann. Rep. Dept. Agric., British East Africa*, 1916-17, in which it is estimated that the area devoted to this crop now amounts to 15,000 acres. The production amounts to about 400 tons per month, and it is expected that it will soon increase to between 700 and 800 tons per month, or about 8,000—9,000 tons a year. A hydro-electric plant has been erected about $3\frac{1}{2}$ miles below the junction of the

Chania and Thika Rivers for the purpose of supplying power to certain Sisal hemp factories, and similar schemes are under consideration for providing electric power for other factories. There is a practically unlimited area in the protectorate suitable for sisal cultivation, and the further development depends on the introduction of capital and the supply of the necessary labour.

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During the war the proper provision of life belts and other life-saving appliances on ships became of vital importance owing to the submaring menace. One of the most widely used appliances was a life-jacket stuffed with "kapok" or floss. This floss has very great buoyancy, a jacket containing 24 oz. of the fibre being capable of supporting an adult in the water. According to the existing official regulations the only kapok that may be used for this purpose is Java kapok and consists of the long hairs surrounding the seeds of a tree which occurs abundantly in the Dutch East Indies. A similar material is, however, obtainable from India, but from a different tree, and this Indian floss cannot under the existing regulations be used for life-jackets. The results of trials made at the Imperial Institute, details of which are given in the current number of the *Bulletin of the Imperial Institute*, have shown that the Indian floss can fully satisfy all the requirements as regards buoyancy and freedom from water-logging. It is therefore suggested that the use of Indian kapok should be officially permitted for life-jackets. Enquiries made by the Imperial Institute showed that kapok, equal in quality to that used in the trials, is available in India in large quantities.

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His Majesty's Commercial Secretary at Yokohama reports that a meeting of factory inspectors stationed in different parts of Japan was recently held at the Department of Agriculture and Commerce at Tokyo.

The chief difficulty before the factory inspectors, according to one of the representatives who addressed the meeting, was the enforcement of the provisions of the Japanese Factory Law relative to the restrictions of working hours and the employment of juvenile labour. The factory law has entailed a reduction to twelve working hours per day whereas formerly the working day was in some cases seventeen hours. The employers have thus been obliged to adjust their factory methods but seem to have obtained in a twelve hours' working day the same output as was formerly attained in seventeen hours. No factories seem to have discharged operatives as a result of the enforcement of the factory law but in some cases the number of operatives has been reduced to fourteen or less in order to avoid the application of the Act. He went on to say that factories coming under the Act showed a much better condition than others and that generally speaking the Act had proved a great advantage to factory employees. Employers in textile mills had applied for an extension of the postponement of the twelve-hour rule but in vain, and all textile industries are now subject to the twelve-hour rule. The times have advanced and in view of the particular importance attached to the labour problem in Europe and America, it was impossible to grant any further concession to the masters; it was incumbent on the latter to realize, in order that the factory Act might be a success, what they owed to their operatives and that operatives should themselves realize what their rights and duties were.

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In pre-war times the opium used in this country for medicinal preparations and for the manufacture of morphine was obtained from Turkey and Persia. It was at one time believed that Indian opium was not rich enough in morphine to be employed for these purposes.

Although this is true of a large part of the opium prepared in India for export to the East, it is now clearly established that opium suitable in every way for medicinal use in Europe and for the manufacture of morphine can be readily obtained from certain areas in India. So long ago as 1896 the Imperial Institute suggested to the Government of India that the production of medicinal opium for exports to Europe should be undertaken. No action was however taken in this direction until 1907, when the question was again considered at the suggestion of the Imperial Institute in connection with the restrictions which were then placed on the future export of Indian opium to China. Finally, after the outbreak of war, the Government of India permitted the export of a certain quantity of opium to the United Kingdom for use by manufacturers of morphine, and it is hoped that the trade thus begun will be developed and firmly established. The proof that Indian opium is of much better quality than was previously supposed is mainly due to investigations carried out at the Imperial Institute. In a detailed report published in the *Bulletin of the Imperial Institute* in 1915 it was shown that of 102 samples of opium from different parts of India about half could be substituted for the best Turkey and Persian opium employed in European medicine, whilst an additional 25 per cent could be used for special medicinal purposes for which a smaller proportion of morphine in the opium is sufficient. The results of further investigations, which are published in the current number of the *Bulletin*, confirm the earlier opinion as to high quality of Indian opium. The average amount of morphine in 24 samples from various parts of the United Provinces was found to be above the highest standard demanded by the British Pharmacopoeia. In fact 19 of them were so rich in morphine that they would need dilution with lower-grade opium before they could be used for medicinal purposes in the United Kingdom. Similar results were obtained in the case of 12 samples of Benares opium, representing the different kinds available for export, all of which were found to be quite suitable for medicinal use or for manufacturing purposes in the United Kingdom.

GLEANINGS.

Considerable interest has been aroused in Brazilian commercial circles by the visit to Brazil of the Vice-President of the Chamber of Commerce of Tokio. He has visited the coffee districts of Ribeirao Preto and other agricultural districts of the State, of Sao Paulo, and has been received at a special session of the Rio de Janeiro Commercial Association, to which he was accompanied by the Japanese Minister. In reply to a speech of welcome he referred in eulogistic terms to the great future which Brazil offered as a market for Japanese manufactures, and stated that on his return to Japan he would endeavour to bring about a visit of Brazilian delegates to that country. The Japanese Minister also addressed the assembly and, in the course of his speech, referred to the monthly service which Japanese steamers already maintained with Brazil, and which would shortly be increased. He also expressed great hopes as to the strengthening of commercial relations between the two countries which would result from the opening of the branches of the Yokohama Specie Bank in Brazil, for which a charter had already been solicited from the Brazilian Government.

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A body entitled "The National Industrial Corporation of Africa, Ltd.," has been incorporated on the initiation of the National Bank of South Africa, Ltd., with a view to financing and fostering industrial undertakings in South Africa. It will specially devote itself to the encouragement of industrial enterprise by means of financial aid and otherwise as may seem desirable. The Corporation is prepared to provide financial assistance to approved concerns in the form of long-dated loans and by subscribing capital, repayment of which may be extended over a longer period than is usually conceded

by bankers. The present company is taking up the work which has for some years been carried out by another well-known company. South African industries have received a considerable impetus during the war, as the Census statistics published from time to time in the *Board of Trade Journal* show. Ample scope exists for the creation and extension of industrial enterprises in the Union, where raw material is, of course, abundant.

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Mr. Andrews recently wrote in the *Modern Review*:—"Nowhere in the world, except in Japan and China, are cotton mills worked at such long hours and under such exhausting climatic conditions as in India. The Indian Factory Act allows a working day of twelve hours' full work, the only stipulation being that there must be an interval of half an hour, in the course of the day's work, during which the machines are not to be used. The Mill may therefore run from 6-30 A.M. in the morning to 7 P.M. at night, with only an interval of half an hour in the middle of the day for food and rest. When we compare such a day with that common in English or American mills, we find that the Indian mills are kept running between twenty-four and thirty hours longer each week than those in the industrial West. The Indian mills run for 72 hours per week, the mills in England and America run between 42 and 48 hours per week."

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No fewer than seven new sugar mills "go about" for the first time in Cuba this year. The largest will, if weather and labour conditions are favourable, produce 15,000 tons of sugar, the average output per factory among the newcomers being about 10,000 tons. Mr. H. A. Hinely places the 1918-19 Cuban crop at 4,010,571 tons against Gun-Meijer's figures of 4,600,000 tons. Mr. Hinely estimates the General Delicias will produce during the season 93,000 tons of sugar, the next largest producers being the Chaparra with 78,000 tons and the Boston

with 77,000 tons. Other large producers will be the Stewart (75,000 tons), the Manati (71,000 tons), and the Espena, Carragua and Moran (64,000 tons each). In Mysore we are still practically where we were in 1914.

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By two Decrees recently published, the coffee monopoly will not come into force in Italy, and it is probable that a law will be passed, based on the principle of freedom of commerce with a tax on a sliding scale according to the place of origin. The first Decree (No. 1064) prorogues the coming into force of the monopoly of substitutes of coffee, and the second (No. 1066) prorogues the application of the Decree of 18th May to the abolition of the tax on the manufacture, and of the communal customs on substitutes of coffee.

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The shortage of coal has turned the attention of scientists to the possibilities of deriving power from the river Rhone, and the Government has planned a gigantic hydro-electric scheme developing 750,000 horse power. The damming of the river will render it navigable for vessels of 1,200 tons to Switzerland, whilst it will also irrigate vast fertile tracts of land. It will take fifteen years to complete the scheme, which is estimated to cost £ 100,000,000.

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About 250,000 acres are under Coconut palms in Travancore. The estimated crop may amount to about 500 million nuts on a rough idea of 2,000 nuts per acre. About 175 million nuts are consumed in the country and the balance exported in the form of Copra oil and whole nuts. The Director of Agriculture in Travancore thinks that if proper attention were paid to cultivation and manuring the output per acre could be easily doubled.

The Australian Commonwealth Government are making investigations with a view to finding suitable raw material in Australia for the manufacture of paper in large quantities. Up to the present time nearly the whole of the paper used in Australia is imported.

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The *Board of Trade Journal* for 31st July in a special article indicates clearly the scope of the amending Bill relating to the Patents and Designs Act, 1907, which was recently read a second time in the House of Commons.

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A writer in the *Manchester Guardian* states that whilst the paper industries in 1911 employed 400,000 work people, only 39,000 of these were engaged in paper manufacture itself.

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The plantation of new joint-stock companies is the order of the day in Calcutta. In Mysore, *seniper idem* seems to be the rule in regard to this matter.

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The *Paper Container* is a new shilling monthly trade Journal dealing with the manufacture of paper bags, cardboard boxes and containers.

TOPICS FROM ECONOMIC PERIODICALS.

PREPARATION AND PRESERVATION OF FOOD.

The Food Investigation Board of the Department of Scientific and Industrial Research, 15, Great George Street, Westminster, London, S. W. I. which was established with a view to "organize and control research into the preparation and preservation of food," has just issued its Report for the year 1918. It is explained in the Report that when the Board was founded there were in existence three bodies concerned directly or indirectly with questions touching food, namely, the Public Health Department of the Local Government Board, the Development Commission and the Medical Research Committee. The Board have points of contact with each of these Departments. But in its broad aspects their field of work is distinct. The scientific work of the Board lies not in the production but in the handling of food. Their responsibility is to the manufacturer and the distributor and their aim the organization of scientific research in those branches of science cognate to the preparation, storage and distribution of food. A number of Committees and Sub-committees have been established and they are engaged in the study of special problems. An idea of the investigation actually in progress can be gathered from the following extracts from the Report describing the work of each Committee :—

FISH PRESERVATION COMMITTEE.

The terms of reference to the Committee are wide, the object being to deal with all aspects of the handling of fish once they have been caught.

The Committee have been mainly occupied with the investigation of a method known as brine freezing, in which the fish to be frozen are plunged into strong brine cooled to 10° F. or lower. Owing to the high specific heat of the brine, cooling is much

more rapid than in the ordinary air freezing process and the separation of fluid and solid in the tissues which occurs when extraction of heat is relatively slow is thereby prevented. The flesh of the fish remains firm when thawed out and colour and superficial appearance are preserved.

The method was tried many years ago by Messrs. J. & E. Hall, but the time was not then ripe for its acceptance. More recently it has been developed into a working process, especially in Denmark, and the Committee understand that it is in use in the Scandinavian countries and in Germany.

The present position with respect to brine-freezing may be briefly stated as follows. The Committee are satisfied as to the soundness of the process both as regards the scientific principles involved and the complete preservation of the fish which results. It remains then to determine how far the process is commercially feasible. For this, experiments on a commercial scale are needed. Arrangements were made to carry these out early in the year but, for reasons connected with the war, they broke down. The Committee are engaged upon the largest scale experiments of which the plant now at their disposal is capable. Determinations of the keeping qualities of fish preserved by brine-freezing when stored for long periods are also in progress. Experience has shown that this needs examination.

The development of a method for dealing with gluts of fish by the application of brine-freezing may be said to be the immediate work of the Committee. Other more general problems such as the specific character of the bacteria which live in the tissues of fish, and the advantage or disadvantage from the points of view of putrefaction of gutting the fish before freezing, are being taken up as thoroughly as the difficulties imposed by the times on the getting together of a staff of investigators permit.

ENGINEERING COMMITTEE.

The work of the Engineering Committee may be said to be a continuation of that of the Refrigeration Research Committee of the Institution of Mechanical Engineers who were appointed to consider and define a standard in refrigeration and its units of measurement.

It was decided at the outset to leave questions concerning refrigeration engines for the time being and concentrate upon the problems presented by the development of cold storage, namely, the type of wagon or barge best suited for the carriage of frozen produce on railways or waterways and upon problems of insulation.

The Insulation Sub-Committee have established a plant at the National Physical Laboratory for

experiments upon the influence of the nature and construction of the walls upon the flow of heat into a closed space, and Dr. Ezer Griffiths, a member of the staff of the Laboratory, is conducting the experiments under the immediate supervision of Sir Richard Glazebrook.

The changes of food preserved in cold stores are largely governed by the degree of humidity, and it is therefore important to the industry to be in possession of instruments capable of recording the quantity of moisture in the air of stores. The designing of simple and reliable instruments to measure the very low tension of aqueous vapour which exists at low temperatures is best with difficulties. Professor Tyndall, of the University of Bristol, has devoted considerable attention to the subject of accurate hygrometry, and the Committee decided to assist him to continue his researches, and also to initiate experiments at the National Physical Laboratory.

MEAT COMMITTEE.

The work organized by this Committee covers a wide range. It has long been known to the industry that whereas mutton can be frozen without impairing its qualities, beef needs much more careful treatment. Freezing in the ordinary way, that is by cold air, causes a separation of fluid in the substance of the muscle fibres, with the result that on thawing, unless somewhat elaborate precautions are taken, there is loss of water and soluble constituents, and the texture of the meat is impaired. The Committee therefore decided to set up an enquiry into the cause of the peculiar sensitiveness of beef to freezing. Is it, for instance, due to the difficulty in abstracting heat from the tissues of so large an animal as the ox, or is it due to the colloidal properties and chemical constitution of the muscle fibres themselves? Is the permeability of the sarcolemma of the muscle fibre of the ox different from that of the sheep?

The answer to questions such as these can be found only in accurate and detailed measurements in the laboratory. They belong to biophysics and by no means to the least intricate region of that science. Detailed determinations of the co-efficients of conductivity of heat, and of diffusion of salts need to be made as well as large scale experiments upon the carcasses of freshly killed beasts. Fortunately both heat flow and the diffusion rates of salts are governed by similar equations and the theory of dimensions is applicable in its simplest form. Experiments in the laboratory on the carcasses of small animals can therefore be utilised freely.

This work as a whole is under the general supervision of Professor W. M. Bayliss, the laboratory work being conducted in his laboratory at University College, London, where a special experimental plant

for investigations at low temperatures has been installed. For the large scale experiments a cold store has been acquired in the north of London through the kindness of the Colonial Consignment and Distributing Company, Limited.

Nothing could better illustrate the wide application of organized research where the basal problems are not lost sight of than this work. The results so far obtained promise not only knowledge immediately useful to the cold storage industry, but also a fundamental contribution to the theory of the colloidal state and a fresh insight into the distinctive colloidal characters of the living substance of the animal and the plant.

The dietetic value and the sapid qualities of meat as it reaches the consumer are determined by *post mortem* changes in chemical constitution. These, which are known under the general title of autolytic changes are little understood. The chemistry, for instance, of the substances which confer flavour is completely unknown. An intensive study of autolysis has been organized in the Biochemical Laboratory, Cambridge, under Professor F. G. Hopkins. The experiments are being conducted by Mr. W. Fearon, with the assistance of Miss D. Foster. A study of the influence of blood upon the rate of autolysis is yielding results of interest and, possibly, of practical importance. The isolation and study of hitherto unknown flesh constituents which appear to play a part in survival changes is proceeding. Comparative analysis of beef and mutton in various conditions are also in progress.

Under industrial conditions the normal course of autolysis as it occurs in sterile tissues is modified to a greater or less extent by bacteria and moulds. Arrangements therefore have been made for the study of what might be called the pathology of the meat industry in close association with the study of autolysis. Dr. Graham Smith is engaged upon the study of the life history of putrefactive organisms in the Pathological Laboratory at Cambridge, and Mr. W. Foreman works in the School of Agriculture upon the chemical changes induced by them.

This work so far as it has progressed up to the present may be sketched as follows. The organisms found in meat in the earlier stages of putrefaction are being isolated in pure culture and their mode of growth followed. Special attention is being given to the effect of temperature and of the chemical composition of the medium in which they are cultivated upon the rate of growth. In order to establish the nature of their action it is necessary to discover some method of sterilising meat which shall not so change its physical and chemical character as to

render the results of experiments incapable of application to the actual conditions existing in the industry in which the organisms have to make good their footing and grow in flesh which has been subject only to intrinsic *post mortem* change. Sterilisation by heat obviously is inapplicable. This problem is one of considerable difficulty, and it must be solved before real progress can be made.

In order to follow the action of the organisms, rapid and accurate methods for estimating the extent of chemical change induced in the flesh are necessary. Mr. Foreman is working at these methods of analysis with much promise of success.

A systematic investigation of the moulds which infect cold stores is in progress under Mr. F. T. Brooks, who is at present working at the Imperial College of Science and Technology. Attention has already been directed to the need for differentiating between meat attacked by putrefactive bacteria and that infected only by surface moulds and to the possibility of saving considerable quantities of the latter for consumption.

Certain special investigations are in charge of Captain L. F. Newman, A.S.C., lent for this work by the War Office. One of these is an attempt to measure the dietetic effect of small quantities of dried blood when added to the ordinary fattening diet of the pig. It has been claimed that the addition of the blood is followed by a striking increase in the rate of increase of weight of the animals. Captain Newman's experiments are designed to test the accuracy of this claim.

The general plan of the organization briefly outlined above may be summed up by saying that the Biophysical work has its head-quarters in London at University College, and the Biochemical work, both normal and pathological, in the Biochemical, Pathological and Agricultural Laboratories at Cambridge.

OILS AND FATS COMMITTEE.

The Committee was formed to investigate certain questions submitted to the Department by the Oils and Fats section of the Ministry of Food and referred by the Advisory Council to the Board. The general nature of the enquiry to be undertaken is defined in the terms of reference as "a survey of the sources of supply of edible oils and fats with the object of increasing the proportion available for human consumption."

At the request of the Committee the Oils and Fats section of the Ministry of Food carried out a preliminary statistical survey of the quantities and nature of edible oils used in industry in processes such as tanning, the tempering of steel, etc., and a general

survey memorandum of the chemical problems involved was prepared by Professor A. Lapworth, Professor of Chemistry in the University of Manchester, and Professor R. Robinson, Professor of Organic Chemistry in the University of Liverpool. The outcome of the discussion of these documents was the formation of two sub-committees, the first of which may be styled shortly the Chemical Sub-Committee.

The refining of edible oils is practically a new industry in this country and it offers many problems such as, e.g., the evaluation of a definite chemical standard of quality. The function of the Chemical Sub-Committee is the survey of this field of research and the co-ordination of the work.

The second sub-committee, under the Chairmanship of Colonel Sir Frederick Nathan, K.B.E., was formed to confer with leading chemists actively engaged in those industries which consume sensible quantities of edible oils with the view to discovering substitutes.

In addition to the broad field of work outlined above special questions have been remitted to the Committee by the Ministry of Food, such as the distribution of accessory food stuffs (vitamines) in edible fats of various origin and history, and the presence of traces of nickel in hardened fats.

Questions concerning the presence of accessory food stuffs in oils and fats must necessarily engage the attention of the Committee since they in part define the dietetic value of edible fats. They have in this region the promise of all the assistance necessary from the Medical Research Committee who have organized a powerful committee to carry out research covering the whole field of accessory food substances. Arrangements have been made to keep the two bodies in touch whenever the special relation of these substances to fats arises.

FRUIT AND VEGETABLE COMMITTEE.

The work of the Committee has been hampered by a technical difficulty. Fruit and vegetables are living structures which are killed by being frozen. Experiments, therefore, must be conducted within a narrow range of temperature at or about the freezing point and instruments are needed capable of maintaining a given temperature within the range for long periods and very exactly. Existing thermostats are designed for the regulation of temperature above that of the surroundings by controlling the influx of heat from some source. No device for the accurate regulation of temperature by control of the influx of cold exists, and this is what is needed for the work on fruit and vegetables.

Research under the Committee is in progress at two centres, namely, at Cambridge under Dr. F. F. Blackman, and at the Imperial College of Science

and Technology, London, under Professor V. H. Blackman and Professor J. B. Farmer.

The part of the general work on Fruit and Vegetables taken up at Cambridge may be described as a study of the normal physiology, at low temperatures, of those parts of plants which are used for food. These are nearly always massive, bulky tissues in which the gaseous exchange of respiration is thereby rendered slow and difficult. The influence of the composition of the surrounding atmosphere, of its content of oxygen, carbon dioxide and water vapour, was an obvious point to begin at, and such work has been taken up by Dr. F. Kidd. For the present and until a suitable apparatus for the regulation of cold is available he has been working at these influences at ordinary temperatures.

The composition of the air of fruit stores has been suspected of being of importance and this calls for thorough elucidation. Interesting results in stopping the sprouting of stored potatoes have been obtained, and a number of data with various fruits proving the importance of the composition of the air.

A sound line of work has been taken up by Miss M. Wheldale, who is studying the oxidising enzymes in fruits, which are responsible for the browning of the flesh of ripe fruit. New knowledge has been obtained on the distribution of these oxidases and the factors which are concerned in their activity.

Work at the Imperial College of Science and Technology was begun only in May of this year, so that the investigations have been mainly of a preliminary nature and have been confined to a study of apples.

The work falls under four heads: a study of the chemical changes occurring during the maturation and storage of the fruit; a study of the effect of various external conditions upon the fungi which cause deterioration of stored fruit; a study of the condition to which fruit is subjected in commercial cold storage, and the testing of a small refrigerating plant for laboratory purposes.

It is proposed to follow out the chemical changes occurring in fruit during maturation and storage by investigating the chemical and physical behaviour of the expressed juice of apples stored for various periods, both under normal conditions and also at low temperatures. For such work it is very important to have a method for obtaining with ease and rapidity satisfactory samples of the sap. Various trials have been made, and as a result the procedure now employed is to cool out portions of the apple for 16-18 hours in a freezing mixture, and then express the juice with a small hand press. This method gives an extract which, so far as substances of small molecular weight are concerned, seems to afford

satisfactory samples of the sap of the fruit. Substances of high molecular weight, such as pectins, are, however, held back to a considerable extent, for it is found that later portions of the expressed sap have a much lower viscosity than that characteristic of the early portions. This point is being investigated further.

As a complete carbohydrate analysis of the sap cannot be carried out in a few hours, it became necessary to develop a method by which the sap could be stored under conditions in which it would undergo no alteration. As a result of a number of experiments the following procedure has been adopted. The freshly expressed juice is neutralised with calcium carbonate, boiled rapidly to destroy enzymes, and filtered. The filtrate is treated with basic lead acetate which precipitates tannins, dextrins and pectin; it is then filtered and the excess of lead removed with sodium carbonate. The solution can then be preserved under toluene for an indefinite time.

With a view to the possibility of following the nitrogenous metabolism of the apple the nitrogen content of the sap was determined. It was found to be extremely low, only 0.00014 grams. nitrogen per cc. of juice being present in the sample tested. Of this nitrogen 40 per cent appears to be present as ammonium salts, the rest as simple amino-acids; no measurable amount of protein could be detected in the sap.

It is proposed to follow the changes in the carbohydrates by determinations of the quantities of (a) starch, (b) cane sugar, (c) reducing sugars (maltose glucose, fructose, pentoses) in the expressed juice, using mainly the methods of Davis, Daish, and Saw Sawyer. For the estimation of reducing sugars various methods have been tried, and that of Bertrand finally adopted, since it is a fairly rapid one and has a very sharp end point.

The physical changes progressively occurring in stored apples will be studied by expressing the juice from samples taken at regular intervals and investigating (1) depression of the freezing point, (2) density, (3) viscosity, (4) electrical conductivity, (5) concentration of hydrogen ions. The latter concentration will be compared with the acidity determined by titration. The apparatus for investigation of the hydrogen ion concentration, and that for electrical conductivity, is now in working order and a number of observations have been made. It has been shown that the presence of non-electrolytes in the sap markedly reduces the electrical conductivity; in deducing the content of electrolytes from the electrical conductivity of such sap, allowance must

therefore be made for the presence of non-electrolytes. In previous work on plant saps this source of error has been entirely overlooked.

An examination of the effect of external conditions on the growth of fungi producing the decay of stored fruit has been undertaken by Dr. W. Brown. The various fungi concerned are being isolated and the effect on their germination and growth of low temperatures and of various concentrations of carbon dioxide is being studied.

Preliminary observations upon the temperature and moisture conditions in a commercial cold storage plant have been made by Dr. Brown at the cold storage plant of Messrs. Mount and Son, of Canterbury, following on observations made during a visit to Canterbury by Dr. F. F. Blackman, Professor V. H. Blackman, and Professor J. B. Farmer. The temperature of the apples and of the air of the chamber has been taken and the humidity of the air measured. It was found that while the humidity of the general air of the chamber was about 85 per cent the air immediately adjacent to the apples, which are stored in boxes, had a moisture content of 98 per cent. The cooling machine when first started was not working up to its full power, so the readings obtained of the rate of fall of temperature of the apples cannot be regarded as being normal.

Trials have been made of the suitability for exact experiment of a small commercial refrigerator. Its cooling action depends on the evaporation and condensation of sulphur dioxide which is circulated by means of a pump driven by an electric motor; the machine is air cooled by means of a fan and radiator. The apparatus has a device for controlling temperature by an automatic starting and stopping of the motor when the temperature rises and falls. The machine as first supplied had a number of small defects and was under-power, and there has been delay in obtaining a more suitable motor. Such a motor, however, is now available, and the small defects have mostly been remedied. The apparatus can doubtless be made to work well as a small refrigerator for the laboratory if the packing of the pump remains gas-tight. For fruit storage it will require some device for cooling the air before passing it over the apples in order to avoid the condensation of water upon the fruit. The refrigerator just mentioned is of course a very small-scale plant and as the work goes on and the actual problems become clearer, it will be necessary to erect a refrigerating plant with several chambers.

CANNED FOODS COMMITTEE.

The Committee was established on November 1st, 1918. The terms of reference to the Committee are as follows;—

To consider and report upon the Bacteriology and Chemistry of:—

- (1) Canned and Glass-packed foods preserved by heat and hermetic sealing; and
- (2) Condensed Milk.

POSSIBILITIES OF A FIR AND SPRUCE LUMBER TRADE IN INDIA.

Mr. E. A. Greswell, I.F.S., contributes to the *Indian Forester** the following article on the possibilities of a fir and spruce lumber trade in India:—

As Spruce and Fir have come to the fore under stimulus of the war demand, and working-plans of these forests are either being drawn up or are contemplated, it may not be out of place for the writer to put forward a few reflections based on the experience he gained while supervising the munitions timber supplies from the Punjab during 1917 and 1918.

Prior to the war the extensive tracts of Fir and Spruce forests in the Punjab and Kashmir had generally not been touched. Such logs and scantlings as reached the river depots were the outturn of trees standing in Deodar and Kail forests; these were felled purely for silvicultural reasons and the price obtained barely covered royalty and extraction charges.

Such was the position up to the end of 1916 when the war demand began. In the ensuing two years, approximately 80,000 tons of coniferous lumber were supplied from Punjab depots to oversea bases and against various Indian indents, an amount in itself possibly less than the total extra tonnage absorbed by the Railways and Military Works Department for overseas and local consumption respectively.

Under this strain the available supplies of Deodar, Kail and Chir were rapidly exhausted and never adequately replaced, proving that the more extensive exploitation of these species is not yet possible. The deficiency, however, was fully made up by the ever-increasing supplies of Fir and Spruce especially from Kashmir. The overseas bases, chiefly Basra, received 20,000 tons of this timber, while the Military Works Department, which came late into the market used it extensively on temporary barrack construction. The market price of the beam 14' x 12" x 6" and over in length and section rose from a pre-war

*Issue of June, 1919 (Vol. XLV, No. 6), copies of which can be purchased at the "Pioneer" Press, Allahabad, at Re. 1. The following are the other important articles in the volume:—The Board of Forestry, 1919, Triennial Meeting; The growth of Sal from Broadcast Sowings, by G. M. Cooper, I.F.S.; The Food Plants of Indian Forest Insects, Part III, by C.F.S. Breson, M.A., Forest Zoologist.

rate of Rs. 5 to Rs. 12 each, and of the log from annas four to Re. 1 per cubic foot.

It is, of course, too early to offer an opinion as to its durability in the works on which it has been used. Large quantities were supplied as crating to Cawnpore factories, and now as tea chests to Calcutta: there is little doubt that for purposes of this nature it has no rival. As lumber for building works, however, local trade opinion has been in the past so antagonistic to its use that its suitability appears open to doubt. While its susceptibility to damp and, of course, white-ant attack is admitted, yet the absence of any proof as to its defects on other grounds justifies the assumption that trade opinion is unduly influenced by a prejudice probably based on its comparative value with that of the other more popular species or on the fact that the supply of these in the past sufficed to meet the local demand. Its known defects are insufficient to debar it completely from use under conditions favourable to durability.

Judging from the absence of complaints against this timber, when properly converted, the war bases have presumably found it satisfactory for building works. This is somewhat negative proof, yet it has been used so largely in Military Works barracks in the Punjab and at Quetta that ample data as to its suitability can, if necessary, be obtained. The most remarkable example of its use in the new Grand Trunk Road bridge over the Haro, between Serai Kala and Campbellpur, in which the whole of the decking and part of the trestle-work is composed of Fir and Spruce supplied from Messrs. Spedding and Co.'s saw-mills at Jhelum.

It is also interesting that three English Saw-mill foremen who have visited these mills during the past year have expressed the opinion that there is no apparent difference between the Himalayan species and its European equivalent.

The suitability of Spruce for aeroplane construction was investigated by the aeroplane timber expert early in 1918, but his decision was unfavourable partly because of knots and partly because of short length. The only timber then available for inspection were some poor quality Kashmir Departmental logs and the ubiquitous beam from which nothing can be expected. There is little doubt, therefore, that the decision passed was premature. The Spruce logs which arrived subsequently from Messrs. Spedding & Co.'s forests in Kashmir were of magnificent quality and undoubtedly up to specification; moreover, there is hope that some of the Kashmir forests at least can supply logs of the desired length even under the present methods of extraction.

The matter is worth further investigation more especially as the Himalayan Spruce is the longest

fibre of all Spruces. At the same time the specification is so severe that the production of aeroplane Spruce alone is at present not a commercial possibility but can be worked only as an adjunct of an ordinary lumber business. The prospect of the infinitesimal yield of suitable timber obtainable militated largely during the demand against any further investigations into the possibilities of working standing Spruce. The extent of wastage can be gauged by the fact that in the earlier types of aeroplane the amount of finished Spruce timber was 20 cubic feet to produce which over 150 cubic feet of selected Sitka Spruce planking was required.

Unfortunately, the increased output of this timber has been devoted almost entirely to military consumption with the result that its possibilities have not been introduced to Indian markets outside the Punjab. Nevertheless samples sent to Calcutta in 1917 and 1918 drew an offer for long length slabs of over Rs. 3 per cubic foot f.o.r. Calcutta or, say, about Rs. 2-8-0 f.o.r. Punjab. This is, of course, an inflated rate but affords some proof that Fir and Spruce could, with freightage preference under normal conditions, compete successfully with imported Japanese Pine in the markets of Northern India.

It is a remarkable fact that a timber, so well known in the British lumber trade, is hardly recognized in India outside the Punjab. It is understood that, in such adjacent territory as Sind and Baluchistan, Fir can be substituted for Kail or Chir without comment. In the Karachi market all coniferous lumber was till quite lately known as Deodar and demanded a special rate apparently based on the rates of sea-imports. Again, Ordnance factories know only of Deodar and Chir, other coniferous species being covered by the vague term 'deal'.

It is clear from this that the Panjab trader has been in the past blind to the existence of other markets than the Punjab bazaars, though a part of the blame is attributable to the petty quantities in which he deals, and to the high rates of railway freightage. It was not till a Bombay firm, early in 1917, had cornered the whole Deodar market, while another firm had, with considerable professional enterprise, passed off a large quantity of Fir sleepers as a suitable substitute for Sal, that the local trader began to grasp the connection between his timber and the war. He has, moreover, little sense of combination or initiative and has therefore been an easy victim not only of his own failings, but also of the unsympathetic attitude of Government in meeting grievances which are often only too just.

For the promotion of trade Government activity is called for, and in this sphere the Kashmir Forest

Department has already shown great enterprise. Being unable to find a sale for its Fir and Spruce a lease was issued to Messrs. Spedding & Co. at rates sufficiently low to cover the initial expenditure of erecting saw-mills at Jhelum and to compensate for possible failures in the pioneer work contemplated. These mills have now been working for two years and have been of incalculable assistance to munitions supply. They give a monthly output of 1,000 tons lumber, and are fitted with additional machinery for finishing and joinery work. This example is both instructive and refreshing, and judging from the excellent and previously unknown quality not only of the logs exploited but also of the outturn, it is safe to predict the complete success of the Kashmir policy.

As indicative of the future policy of Government, the writer may be forgiven for emphasizing his firm conviction based on two years' experience of the timber which teaches the river depots and of the conversion of the same that it is only from long logs and large squares that satisfactory lumber of any description can be obtained. This applies to all Pine timbers but especially to the Fir and the Spruce, which are the only species in which a surplus for export exists. If this is accepted, it is clear that greater attention must be paid to exploitation. At present logs, and these mostly in short lengths, are to be found only on the Jhelum and Indus rivers, while the vast majority of timber is brought down in the form of more or less carelessly converted and often shattered scantling of 10" x 5", 10" x 6" and 12" x 6" section in lengths from 9' 6" (Railway sleeper) to 16'. The production of timber in this form is inevitable under the present difficulties and methods of extraction, but if allowed to continue will retard the development of the Punjab lumber trade. Special stress is laid on this point because the true interests of the trade are apt to be clouded by the present and possible future high rates to be procured on the market and the danger that the Forest Department, owing to these rates, will either do nothing or will allow its attention to be diverted to interfering, under the semblance of pioneer work, in commercial activities which are not part of its true function and for which it is in no way fitted.

The greatest assistance which Government can now give in the development of the lumber trade lies in the improvement of all processes of conversion, extraction and grading up to delivery of the timber in the sale depot. These improvements, at least on the Beas and the Sutlej rivers, are believed to involve severe engineering problems and heavy expenditure on permanent works, all of which are

obviously beyond the capacity of the forest contractor. His existence is, in fact, a menace to trade development, and it will not be till the whole of his work has been taken over by Government with the honest intention of carrying out these improvements, not with the object of pocketing his profits, that progress will be made. The advantages derivable from the retention of such a monopoly by Government are too obvious to be enumerated.

In this connection the opinion of an officer for some time in the early part of the war responsible for Indian timber supplies to war bases is valuable as an independent summary of the situation:

"If only India could supply more seasoned timber and timber in better lengths, the work would be much easier, but Government seems to have systematically starved the Forest Department so that there are no means of drawing out big logs and all the business seems to be in the hands of petty traders."

COCOANUT GAS AND COKE.

We take the following from the *Mysore Engineers Association Bulletin* for April, 1919:—

Those who have happened to see a cocoanut shell burning need not be told how beautifully and rapidly it burns away. After the shell has been heated to a certain extent and has begun to emit smoke in considerable quantities, if you throw a burning match into it the gas takes fire and burns brilliantly, the shell shooting forth the gas in noisy streams. Nature seems to have concentrated the gas-giving elements in the nut shell so that they rush out at a feeble call from fire.

If we heat the shell of a cocoanut in a gas retort and collect the gas, it burns quietly in a Bunsen burner. I heated 3.5 oz. of the shell and obtained 700 cubic inches of gas. By heating the same quantity of the husk, i.e., the outer fibrous covering of the cocoanut, almost the same quantity of gas was obtained. Calculating from these we may expect that the shell and fibre of an average sized cocoanut, when subjected to destructive distillation, can yield gas which under atmospheric pressure will fill not less than 2,500 cubic inches of space or about 2½ ordinary kerosine tins. Tar and an oily liquid are also produced. Though the quantity of tar produced here is not so great as in the case of coal gas, yet it is not inconsiderable and may prove a useful and valuable by-product. The oil, our Physicians say,

has a great virtue as the healer of long standing sores.

Out of the shell and fibre heated, only about 35 per cent, is left behind in the retort as coke, whereas even the best coal, is said to leave behind as much as 60 per cent as coke. This shows that the gas value of the shell and the fibre is even greater than that of the best variety of coal.

The "Shell-Coke" is of a fine deep bluish black colour. Crushing the shell coke into a fine powder and mixing with linseed oil I have used it as a black board paint. The black board covered with this paint presents a smooth deep black surface and can be used for all practical purposes in the school room. The fine powder of the shell coke can be used in the preparation of black paints and may probably prove to be a good substitute for lamp black.

The gas burns with a fairly luminous flame before passing through water and with a non-luminous flame after it is made to pass through it. In this connection we must remember the fact proved by Berthlet, Dittmar, Frankland and Thorne that the illuminating value of coal gas depends on the presence of benzol vapour, and the vapour is soluble in water. Probably there is only a small quantity of benzol vapour in the cocoanut gas and even this is dissolved when the gas is made to pass through water. Wood gas is largely used in Germany, Switzerland and Russia where wood is more easily obtained than coal. Even in the case of wood the illuminating power was originally very small and was later on increased, by passing the products of low-heat distillation through a range of red-hot pipes or by properly heating wood in ordinary retorts fed with small charges and by burning the gas at considerable pressure in specially constructed burners. If it is granted that the Cocoanut gas can be obtained in an industrial scale, and it is an useful and valuable industry, want of luminosity of the flame is not an insuperable obstacle since the gas can be made to burn brightly by what are known as Carbaretting processes which are generally adopted to increase the illuminating power of the ordinary coal gas to render non-luminous combustible gases, as water-gas, luminiferous and so to load non-combustible gases with hydro-carbon vapour as to make the combination at once luminiferous and a supporter of combustion.

In Malabar, Ceylon and the Laccadives the cocoanut trees are so numerous that the shell and the fibre of which a very large quantity is left behind after being used for coir making are burnt as fuel. In various parts of Malabar, Cochin and Travencore the most frequently used form of fuel is the cocoanut shell. That there is plenty of the shell and the fibre

of gas making seems to be certain if the gas is to be used for lighting or in working gas engines. Even a slight increase in the price of the cocoanut products must be an incentive or the greater cultivation of this most beautiful and wonderful tree, which, as the earthly representative of the Divine *Kalpavriksha* has been specially given to India and the East.

May I request those who have greater facilities for carrying on experiments to produce the gas on a large scale and try to increase the luminosity of the flame by any of the processes used for the purpose.

ECONOMIC EFFECTS OF PEACE TERMS.

The *Berliner Tageblatt* summarises as follows the economic effects of the surrenders of territory required by the Peace Terms :—

AGRICULTURAL LOSSES.

Grain, Roots and Pulse.—Exact figures are available for the provinces of Posen and West Prussia. Both districts had a surplus supply of agricultural products which were available for other districts of Germany. According to the last census, the population of the two provinces was 4'06 millions, or some 6 per cent of the total population of the Empire. But their yield in agricultural produce represented a proportionately greater share of the total German production. Thus, for wheat it was 7'3 per cent, for rye 16'5 per cent, for barley 13'3 per cent, for oats 7'7 per cent, for potatoes 15'6 per cent, for sugar-beet 19 per cent, for pulse 20'2 per cent, for summer straw 9'3 per cent, for winter straw 13'7 per cent, and for hay 7'4 per cent. East Prussia, too, which may, if the plebiscite goes against Germany, lose certain districts, was a surplus-yielding area. The province as a whole produced 5'69 per cent of the total German production of bread grain. To these losses must be added Upper Silesia, Alsace-Lorraine, and in certain eventualities Slesvig, which are either amply self-supporting, or in parts surplus yielding areas. Taking the lost territories as a whole, the German Agricultural Council calculates that not less than one-quarter of the German production of bread grain and potatoes will be lost, while the diminution of population will only represent 10 per cent or a little over, of the total population.

Cattle.—The provinces of Posen and West Prussia, with a population representing 6 per cent of the total German stock; while their stock of milch

cows represents 8 per cent of calves under three months, 6·6 per cent of pigs, 9·3 per cent of sheep, 11·7 per cent of poultry and 8·1 per cent of the respective German stocks. East Prussia and Slesvig are also surplus-yielding districts for meat and milk. Reckoned in terms of calories, Posen and West Prussia can supply 5·4 million persons with a daily ration on a pre-war scale of 2,550 calories, whereas their population is only 4·06 million. Separation of these provinces, therefore, means that food (bread grain, potatoes, sugar, butter, and meat) must be brought from abroad for 1·4 million persons.

INDUSTRIAL LOSSES.

Coal.—The industrial losses are no less serious, Germany's total coal output in the last year of peace was roughly 190,000,000 tons. Of this the Saar district yielded about 13,000,000, Alsace-Lorraine about 17,000,000, and Upper Silesia about 49,000,000. The total loss in coal involved in the separation of the provinces is therefore equivalent to about one-third of the total pit coal output. The Westphalian coalfields, which yield the best European coke, are indeed left to Germany, but clauses are included in the Peace Treaty which considerably restrict her freedom to dispose of this coal for her own purposes. She is placed under the obligation to supply France with 7,000,000 tons of coal a year for a period of ten years, and, in addition, is to supply an amount equivalent to the difference between the annual output of the North French Mines before the war and their actual output in the year in which the delivery is made. This last quantity is not, however, for the first five years to exceed 20,000,000 tons, in the second five years 8,000,000 tons. On the average, therefore, Germany will have to supply France with 22·15 million tons of coal a year, to which must be added 8,000,000 tons a year to Belgium for ten years, and 7,000,000 to Italy for five years. The net result of these obligations is to commit Germany to the delivery of some 37,000,000 tons of coal; and this will have to be deducted from the output remaining to her, which in the years immediately following the war will not regain the pre-war level. The total coal export in 1913 was 34·5 million tons, while on the other hand there was an import of 10·5 million tons. Unless, therefore, Germany can very considerably raise her output, the loss of Upper Silesia and the Saar basin, together with the fulfilment of the remaining obligations formulated in the Treaty, will render necessary a very much larger import of British coal, or a considerable reduction in consumption. A possibility of making good some portion of the coal deficit might possibly be provided by an increase in the production of lignite, which the Treaty leaves almost completely in Germany's hands.

Iron.—The loss of Alsace-Lorraine carries with it the most serious effects on the German iron industry. The full significance of Lorraine is by no means brought out by a mere comparison of the steel output of the provinces (2,286,354 tons in 1913) with the total German output of 18,958,919 tons. The point of decisive importance is rather that not only the Lorraine works themselves but also the remaining West German iron establishments, especially those in Rhenish Westphalia and the Saar basin, cover their ore requirements to a very appreciable extent from the Lorraine mines. In 1913 the Lorraine and Luxemburg iron mining industry contributed to the extent of 28·5 million tons to the total German ore output of 35·9 million tons, and in respect of iron content supplied 8·15 million tons out of a total of 10·54 million, *i.e.*, it supplied not less than 77 per cent. The loss of Lorraine would therefore make Germany dependent for the greater portion of her iron production on foreign ores, of which in 1913 she imported about 14,000,000 tons, with an iron content of 7·7 million tons. It is no doubt true that after the war it will still be possible to obtain ores from Sweden, Spain, and Russia—perhaps also even from France; but the ore basis of the German iron industry would nevertheless be so greatly restricted that a disproportion would arise between raw material and industrial product which would render the continued existence of the industry on its former scale a matter of doubt.

Zinc.—The position of the German zinc industry will also present serious difficulty. The loss of Upper Silesia involves that of the greater portion of the German ore supply, together with all the foundries which work up these ores with the assistance of Upper Silesian coal. It is sufficient to call to mind the names: Giesch's Successors, the Silesian Zinc Foundries, Ltd., and the Hohenlohe Works, to obtain an idea of what the loss of Upper Silesia would mean to this industry. The West German zinc industry, on the other hand, which is concentrated primarily in the three great works—the Rhenish-Nassau Mining and Foundry Co., the Stolberg Zinc Foundry, and the firm of Berzelius, remains practically unaffected by the cession of certain districts to Belgium. The ore mines of these works remain German. It should, however, be remembered that these firms are precisely those which in the years preceding the war were obliged to have increasing recourse to foreign ores to cover their requirements; and that in the meantime German zinc contracts, especially with Australia, have been annulled by the British and Australian courts. What has been said of the zinc industry itself applies also in the main to its bye-products, which, especially sulphuric acid, are valuable basic materials for

the chemical industry. They also apply in the main to the lead industry.

Potash.—It is well known that the German monopoly in potash is broken by the return of Alsace to France. A total of 14 works are thereby separated from the German Potash industry. Their output of potash is about 6 per cent of the total German output. Their real productive capacity is, however, much greater than this, and was only kept down to 6 per cent of the German output by the system of syndication. Their production could be considerably increased, and the extent to which they, and for that matter the Spanish works, are able to affect the foreign sales of the German potash industry has already been shown in the negotiations of the Potash Syndicate with England and America.

Petroleum.—Alsace possesses, in addition, petroleum wells belonging to the German Petroleum Co., Ltd. In peace time they yielded about 42 per cent of the total German output of some 120,000 tons. During the war the completion of the conversion of the Pechelbron Works to an improved system doubled the Alsatian petroleum output, the advantage of which now accrues to France.

Other Industries.—To all the above raw material industries must be added many manufacturing industries, among which the following may be mentioned; in Upper Silesia, the cement, chemical, textile and spirit industries; in West Prussia, the timber-using, sugar, milling, distilling agricultural machine and shipbuilding industries; in Alsace-Lorraine, the leather and textile industries, especially cotton spinning, the machine industry, milling, vine growing, and wine production.

The paper concludes that a country deprived of such immense productive resources will find it impossible both to bear its own war debts and to pay the tremendous indemnities demanded from it. Such an achievement is made the more unlikely in that the provinces to be separated from Germany are under no obligation to take over any share of the German war debt, and in certain respects are even to be indemnified by Germany.

SPEECHES AND PRONOUNCEMENTS.

INCREASE OF FOOD SUPPLIES IN MYSORE.

The following order of the Government of Madras, Revenue (Special) Department, (G. O. No. 1303, dated 7th July 1919) has been issued as a Press Communiqué:—

It is well-known that owing to the war and the unfavourable season during faslis 1327 and 1328 a serious situation has been created in India by reason of the reduction in the stocks of food supplies that has resulted. The Government of India have taken steps to conserve the existing stocks and to increase the supplies by stopping exports from India except under license to certain countries with a considerable Indian population and by arranging for imports from other countries, while measures have been taken to see that the best use is made of the deficient rolling-stock on railways by controlling movements of goods by rail. Arrangements have also been made for the import of rice into India proper from Burma at controlled prices. The export of rice from Burma during the first four months in 1918 to destinations other than India was 716,363 tons, but in the first four months of the current year the exports for those destinations were only 286,100 tons. The export of wheat during the first four months in 1918 amounted to 175,268 tons and to only 2,739 tons in the corresponding period of 1919. From January to April 1918, 412,818 tons of other food grains were exported, whereas during the same period of the current year the export of the same food-grains amounted to 45,426 tons. On the other hand large quantities of rice have already been received from Burma and considerable quantities of wheat from Australia and further consignments are expected,

2. So far as this Presidency is concerned arrangements have been made for the import of rice from Burma and for the import of rice, and Bengal-grain from other provinces in India. Against a monthly allotment of 30,000 tons of Burma rice for the Madras Presidency including Cochin, 1,96,344 tons were imported under licence in the half year ending 30th June 1919. The continuance of these measures will, it is hoped, provide this Presidency with sufficient supplies till the next harvest.

3. The effects of the war were not felt in the Madras Presidency during the first three years to

the same extent as in other countries taking part in it. Other countries have had to take and are still taking far more serious measures for the conservation and replenishment of their food supplies than have hitherto been found necessary in India. Even with the signing of peace the normal conditions in the world will not be restored immediately: the transport of goods must be temporarily restricted owing to the continuance of the effects of the destruction of ships and the wearing out of railway rolling-stock until they can be replaced. While therefore in normal times the Madras Presidency is practically self-supporting in the matter of food-supplies, it is of importance that everything possible should be done to increase the yield of food-crops in fasli 1329 both to provide a sufficient supply for consumption during the fasli and to recoup the reserve stocks in the Presidency which are now reduced. The Government have had under their anxious consideration the means by which they may be able to increase the yield of food-crops. The object of the present communique is designed to set out their proposals for the information of the public and to enlist the effective co-operation of the people of all classes to the same end.

4. There are three principal ways in which the yield may be increased:—

- (1) The yield obtained per acre cultivated may be increased.
- (2) The effect of damage due to pests may be mitigated.
- (3) The area under cultivation may be increased.

5. There is a little doubt that the most potent factor in the variations of yield of crops throughout the whole of India from year to year is the weather. The fall of 770,000 acres in 1915-16 as compared with the preceding year in the total area under food-crops throughout India was ascribed to the fact that weather conditions were not altogether favourable owing to a weak and irregular monsoon and inadequate and untimely winter rains: an increase in the following year of 5,340,000 acres (the total area under food-grains being 209,075,000 acres) was ascribed to the fact that the monsoon during the year was particularly good; it arrived early and continued late, the distribution of rain being remarkably uniform. In 1917-18, in the Madras Presidency the total area under paddy was 11,655,302 acres, *i.e.*, 123,600 acres more than in the previous year; on the other hand the yield of the crop was 9,203,329 tons, *i.e.*, nearly 30,000 tons less than in the previous year.

6. It is the constant endeavour of the Government to ensure that crops on as large an area as

possible are made as independent of the distribution of rain as practicable. One method by which the protected area can be extended is by the construction of wells. The Government have made special inquiries with the object of facilitating the sinking of wells by means of State loans. They have sanctioned the employment of a special staff including a deputy collector and four revenue inspectors for the Ceded Districts and special establishments for the districts of Salem, North Arcot, Chittoor, Madras, Trichinopoly and Godavari. They have also decided that in order to encourage the grant of State loans for sinking wells an engineering staff equipped with an adequate supply of boring tools should be employed in each district to make trial borings and assist the ryots with expert advice on the subject. The Director of Agriculture has been requested to pay special attention to the matter. The Government have further called upon the Board of Revenue to report what special staff will be required in each district for propaganda work and for the prompt disposal of applications for loans. Further the Government have relaxed the rule insisting upon separate applications and separate security under the Agriculturists' Loans Act and the Land Improvement Loans Act and have directed that a consolidated loan may be granted on a single security if it is sufficient.

7. The Agricultural department is engaged on researches into various questions connected with improved methods of cultivation with the object of obtaining a better yield per acre. The results hitherto obtained have been published in bulletins and demonstrated on farms; and ryots have in some places profited by the adoption of selected seed or improved methods of cultivation recommended by the Agricultural department. Much more, however, might be done in this way and the Government trust that wealthier landowners and ryots will spread the knowledge of the result obtained by the Agricultural department by getting into touch with the officers of the departments, visiting the Government farms and adopting under guidance and advice in portions of their own land the improvements which have been tested and found to be sound; thus they will not only obtain profit themselves but will demonstrate to their tenants and to poorer ryots the advantages of adopting the improvements. In this way larger yield may be obtained on land which is already cultivated regularly. It may be noted in this connection that with the prices that are at present ruling it will in many cases pay to increase the production per acre by the introduction of methods of cultivation or manures which in ordinary times landowners may hesitate to use on account of the expense involved.

8. A frequent source of damage to crops is the existence of pests. These are generally insect pests so far as cereals and pulses are concerned. Any ryot finding his crop seriously attacked by pests should at once draw the attention of the village officers to the fact; they in their turn should at once inform the Tahsildar or Deputy Tahsildar who without delay will send specimens of the plants attacked or of the insects doing the damage, if they can be identified, to the Government Entomologist, Agricultural College, Lawley Road Post office, Coimbatore District. The manner in which specimens should be packed and the details to be given in the report to accompany them are explained in the Agriculture Calendar for 1919-20 (page 50). It is well known that attacks by pest may reduce the yield of the crop by a half and every effort should be made to deal with a pest before it establishes too great a hold on the crop.

9. The Government are also anxious that the area under cultivation of food-crops should be extended as much as possible. For this reason they have made the following concessions:—

- (a) Dry food grains may be cultivated during fasli 1329 free of assessment on any unoccupied assessed Government land in the Presidency on which crops have not been raised during fasli 1327 or 1328.
- (b) The Government are addressing the Railway Board with reference to the cultivation of railway wastelands with food-crops for a period of three years from 1st July, 1919, free of assessment.
- (c) During fasli 1329 the cultivation of dry crops may be permitted by Collectors in tank-beds subject to the following conditions:—
 - (1) No person shall be allowed to cultivate tank-bed land under this order unless he is the owner or cultivator of wet land in the ayacut of the tank.
 - (2) The tank-bed should not be monopolised by a few influential persons but should be divided among all the applicants qualified under the first condition in suitable proportions.
 - (3) The highest dry rate of the village should be charged on the area cultivated.
- (d) Dry food-grains may be grown free of charge on backyards during faslis 1329, 1330 and 1331 up to an extent of 25 cents in each case.
- (e) Miscellaneous cultivation under the Divi Pumping project has been authorized up to an extent not exceeding 38,000 acres.

10. In case of failure of the monsoon it will be more than ever important to raise as much food-grain as possible. It seems likely that in such an event much might be done to encourage the cultivation of dry crops on wet lands when the supply of water in a source of irrigation is insufficient for a full crop of paddy. In some cases a total amount of grain can be obtained which is little less than the full crop of paddy at a saving of more than half the water. The rules at present in force permit of this being done and every encouragement and assistance should be given to the people to enable them in the event of insufficiency of the supply of water to grow dry food-crops on wet lands. The local agriculturists are probably aware of the most suitable food-crop to grow on such land; for heavier soils cholam or korra will probably be suitable and for the lighter ragi or some of the smaller millets; pulses of different sorts can be sown alone or mixed with any of the above. If the ryots have any difficulty in obtaining seeds for dry crops the officers of the Revenue Department should endeavour to obtain supplies of seed for them on payment or to instruct them where seed can be obtained.

11. Notice has already been given of the necessity of as much seed-grain as possible. Seed-grain is grain which has been kept in a condition in which its vitality is preserved and which will therefore germinate. Grain for eating is kept in various ways some of which, e.g., storing in pits, spoil it for sowing by killing the germ. It is possible that much of the seeds exposed for sale in the bazaar is capable of germination to a greater or less extent, and the Government Economic Botanist is prepared to test and report on any sample sent to him at the following address:—Agricultural College, Lawley Road Post Office, Coimbatore district.

12. The Government are aware that advantage cannot be taken of the concessions offered by them without some trouble and expense on the part of the people. The high prices of food-grains now prevailing should be in themselves some encouragement to the ryots to extend and improve their cultivation. The Government desire to appeal especially to the zamindars and wealthier landowners for their co-operation in the endeavour to ensure an unprecedentedly large yield of food-crops during fasli 1329, and to the educated classes to spread far and wide a knowledge of the concessions announced in this communique and of the necessity for increasing the yield of food-crops both on land which is now uncultivated and in place of the crops which are only useful as the raw material of industries.

INDIAN SUGAR-CANE INDUSTRY.

The Agricultural Research Institute, Pusa, has issued a Bulletin (No. 83 of 1919) entitled "progress of the Sugarcane Industry in India during the years 1916 and 1917" (Government Printing, India, Price five annas). It consists of notes submitted to the Meeting of the Board of Agriculture in India, Poona, 1917, edited, with an introduction, by Dr. C. A. Barber, C.I.E., Sc.D., F.L.S., Chairman of the Sugar Committee of the Board of Agriculture in India, 1917. We quote below the introductory portion of the Bulletin written by Dr. Barber:—

It has been the custom in the past to collect the mass of notes prepared on the special subjects discussed at the meetings of the Board of Agriculture and to print them as appendices to its Proceedings. When it was decided on the last occasion to abbreviate the Proceedings by leaving out most of these notes, and thus keep the bulky volume within reasonable limits and also issue it more expeditiously, the Agricultural Adviser was approached as to the possibility of printing the notes on the progress of the sugar industry as a Bulletin of the Pusa Research Institute. This form of publication is, after all, much more suitable, for the Proceedings are often not readily available and the information contained in the appendices is liable to be overlooked. Thus far the notes on the sugar industry prepared for each meeting of the Board have been preserved and it was felt that it would be a pity to break the continuity of the record. The Agricultural Adviser has kindly agreed to this suggestion and has asked me, as Chairman of the Sugar Committee, to edit the bulletin and write an introduction. The note on the work of the experimental factory at Nawabganj, in the United Provinces, is not printed here, as it has been issued as a separate bulletin.* No notes were received from Bengal and the North-West Frontier Province, but these have been subsequently prepared at special request, and are included with the rest.

On looking through the reports presented on this and previous occasions for discussions at the Board of Agriculture, the first thing that will strike any one interested in the progress of the sugar industry in India is the marked inequality of the amount of in-

formation recorded regarding different tracts, the amount of detail in no way corresponding to the importance of the work being done or the interests involved. This is, of course, partly a natural expression of the amount of personal attention given to the subject by the different authors of the notes. Some few of them are devoting their whole attention to sugar matters, while others have many other interests to engage their attention. Some of the notes have been written by chemists, botanists or agriculturists, and the point of view differs accordingly, whereas a number have been prepared by Directors of Agriculture, who are in charge of all the activities of their Departments, and cannot therefore be expected to possess the detailed knowledge of the subject which is desirable.

As instances of the meagreness of the information presented concerning important tracts, the reports printed here of the Directors of Agriculture in the United Provinces and Bihar and Orissa may be specially referred to. In the former case, with a greater acreage under sugar-cane than the whole of the rest of India put together, the work of the Shahjahanpur Research Station is practically unnoticed, doubtless in part due to the absence of Mr. Clerke from India at the time. The whole of the cultural varietal work being carried out in the province is dealt with in one short paragraph, although, as will be seen later, the Director regards this as the most important part of the sugar work of the Department. In the report from Bihar, where the greatest number of the sugar factories in India are collected, no reference is made to their work at all. This will naturally be read as an indication that the Agricultural Department is not in touch with them; but a very much fuller and more useful report might have been presented by the Agricultural Chemist, who has devoted much time to sugar matters and done a good deal of useful work on the subject. The Bombay note contains no reference to the extremely promising and important extension of the sugarcane area in the tracts of the Deccan now being opened up by the new system of canals, although a newspaper cutting was afterwards added, at special request, by the Director of Agriculture, containing a summary of his evidence before the Indian Industrial Commission. The Burma note contains no information as to the progress of the Government scheme of opening up a new sugarcane area in the Mon Canal region. But instances need not be multiplied to demonstrate the very partial nature of the information placed before the Sugar Committee by the local authorities. The Committee expressed itself freely on the subject,¹

*Agricultural Research Institute, Pusa. Bulletin No. 12.

¹ Proceedings of the Board of Agriculture in India, Poona, 1917, page 78.

and a general study of the material printed in this bulletin will furnish a strong condemnation of the system at present adopted, as it no longer meets the needs of the case. What is wanted is a much more thorough study of the industry from all points of view, and this bulletin presents a powerful argument for the formation of the Bureau of Sugar Information which the Board of Agriculture proposed should be started, consisting of specialists whose whole time should be devoted to the various aspects of this important industry throughout India.

That the sugar industry in India is in need of immediate attention is agreed to everywhere, and that this is fully realized by Government is obvious from the remarks of Sir Claude Hill in his opening address at the Poona meeting of the Board of Agriculture.¹ It is instructive to note the somewhat divergent views which are held, by different authorities, as to the special defects which are held to be fundamental, and which should be immediately attended to if any hopes of improvement are to be entertained. The process of manufacture of the raw product is admittedly of a very primitive nature and although there is a steady improvement in many places, it is the belief of some that this is the limiting factor which must be attended to before any improvement can be hoped for. This point of view is a century old, and recently been specially advocated by Mr. Sayer in a series of articles in the *Agricultural Journal of India*.² The principles of *gur*-making are undoubtedly in many places woefully wasteful, if not radically wrong. But is not this point of view to a certain extent influenced by the translation of *gur* into white sugar? The ryot prefers this *mixture*, and is even content to pay a higher price for it than for the pure white sugar. Looked at from this point of view, the loss in manufacture is perhaps somewhat exaggerated. The cultivation accorded to the sugar-cane in a large part of India is also extremely primitive. For its improvement, much propaganda work is needed by the Agricultural Department, but this is complicated by the facts that it is extremely difficult to alter, by example or precept, agricultural practice which is firmly rooted, and that the treatment of the canes in the tropics is largely inapplicable to the canes grown in India. It is the opinion in some quarters that, before the cultivation is improved, it is comparatively idle to attempt the introduction of better

varieties. Thus, in his note for the United Provinces, Mr. Hailey writes: "The main work of the Department is concentrated on teaching the people better methods of planting and cultivation, and it is believed that when these are more generally in force the introduction of better classes of canes will necessarily follow; but, until adopted, the best results will not be obtained from the work on the research farm in this province or that at Coimbatore." Lastly, the kinds of cane grown all over the great sugar-cane tract of India are easily the worst in the world, and it is believed by some that this is the basal defect in the industry and that, if better kinds are forthcoming, they will be readily taken up by the cultivator, and that improved cultivation and manufacture will be more likely to follow, when the increased production places the ryot in a better financial position. This is the object with which the Coimbatore farm was started. There is no doubt that the great expansion in the sugar industry in the Madras Presidency, during recent years, is mainly due to the good new kinds of cane introduced through the agency of the Samalkota farm in the Godavari District, and nowhere is this more forcibly exhibited than in the fine sugar factory at Nellikuppam in the South Arcot District.

There three lines of improvement are being continuously studied in all places where the Agricultural Department interests itself in the improvement of the sugar industry, as will be sufficiently obvious if we read between the lines of the various notes brought together in this bulletin. Which direction of work is the more urgent will depend largely on the locality and the conditions of the industry in it, but the general question is of more or less academic interest, for all three are being simultaneously followed in each province. It is, however, none the less a defect that these efforts are detached and independent, little being known in one province of what is being done in another, what methods are being adopted and what lines of work have been found to be most successful. And it is this fact that has led the Board of Agriculture unanimously to support the suggestion of the Sugar Committee that an Imperial Sugar Bureau should be formed, whose duty will be to collect and collate the results obtained in various directions, and thus to be in a position to assist the isolated efforts in different parts of the country with sound advice, based on experience gained by a general survey of the work done in India now and in the past, and that accomplished in other countries.

¹Proceedings of the Board of Agriculture in India, Poona, 1917, page 19.

²Volume XI, Parts I and IV; and Volume XII, Part IV.

AGRICULTURAL DEVELOPMENT IN EGYPT.

According to the *Board of Trade Journal*, the following review of recent developments in the Egyptian agricultural industry has been supplied by the Egyptian Ministry of Agriculture:—

Horticultural Show.—An exhibition of flowers and fruits was held in Cairo in November. One of its special features was to demonstrate the wide possibilities offered in local fruit production, and the display of fruit was thus very instructive.

An exhibition of home-grown quinces, a fruit so largely imported for jam-making, attracted great interest. The yield from good varieties was 25 kilogs. per tree or a minimum return of £ E 40 per acre. This shows that even at pre-war prices the local production of fruit would pay handsomely.

Timber.—The country has passed through great difficulties to provide for its timber supplies during the war. Foreign imports were entirely cut off after the outbreak of war, and the country had to depend on its own resources. Timber was required for a variety of uses—building purposes, fuel, the making of industrial and agricultural implements, etc.

Building was very considerably restricted, but the other needs were heavy, and it was feared that the local supply might not be sufficient to meet them, as the country is very poor in forests. Fortunately such has not been the case. The use of home-grown timber has thus enabled wood-workers to appreciate the good quality of certain trees of which they were previously ignorant. As a result of the war many millions of seedlings of quick-growing species have been planted.

Vegetables.—The army requirements of vegetables have been considerable, and it was feared at one time that not enough could be grown in view of the difficulties of obtaining vegetable seeds from abroad. Special measures were taken to ensure against this contingency, and the supply of vegetables has been adequate for all needs. Marketing is, however, very unsatisfactory, as the returns to the cultivator from his market-garden produce are much below the retail prices.

Production of Citrus Fruits.—The prospects of this season's crop are generally good in Upper Egypt, but unsatisfactory in Lower and Middle Egypt.

It is noticed that fumigated plants are bearing more heavily than those not so treated, and it is

hoped that the conclusion of the war will lead to the popularising of the practice of fumigation, by making it easier and less expensive to obtain the necessary materials. This is the only practicable method of controlling the scale insect, which at present constitutes the chief obstacle to the spread of citrus cultivation in Egypt. Lime trees are less subject to injury than orange and mandarine and are remuneratively grown, but the fruit production is too small for export. Improved varieties are, however, being propagated by the Ministry of Agriculture with a view of reducing the period due to elapse before they commence bearing. By using grafted plants, it has been possible to reduce the period by two years at least.

Bureau of Commercial Intelligence.—A bureau of commercial intelligence was started in the Ministry of Agriculture in September, 1914, for the purpose of furnishing information connected with Egyptian agricultural products for export, and with reference to markets for imported products, the bureau acting as an intermediary between the producer and the consumer. Samples of produce are prepared for submission to inquirers in all parts of the world, and information is supplied to producers to enable them to prepare their produce in a manner suitable for foreign markets.

Manures.—During the war, Egypt had to depend on her home production of cereals, and the need for nitrogenous manures was thus keenly felt.

The application of nitrogenous manures to the wheat crop in Egypt results in an increase of from $1\frac{1}{2}$ to 2 ardebs, or 7 to 10 bushels per acre.

During 1913 more than 60,000 tons of these manures were imported, resulting in a probably increased production of 5,000,000 bushels of grains. A similar increase would result in the amount of straw. A shortage of nitrogenous fertilisers was thus bound to have a serious effect on the supply of grain.

With the end of the war there should be a favourable opportunity for the introduction of nitrate of lime. Experiments made have proved its efficacy, inasmuch as the land of Egypt already contains small quantities of soda.

Superphosphate had begun to be imported before the war, but the quantity is insignificant as compared with nitrogenous manures. Should a demand arise, however, this manure can be manufactured locally, seeing the large deposits of mineral phosphate in the country.

ECONOMIC NOTES.

AGRICULTURE.

The Bombay Department of Agriculture, in its Leaflet (No. 9 of 1918) deals with the cultivation of Cape Gooseberry or Tiparee. The following is taken from it:—

One of the fruits which appears to have a very great future in Western India is the Cape Gooseberry or Tiparee. It is grown on a fair scale in Northern India, and a few of the Poona *malis* cultivate the crop. When it appears in the wholesale market it is immediately bought for despatch to Bombay where it is much appreciated.

The Cape Gooseberry plant is a shrub, three to four feet high, and about four to five feet wide. The fruit is a berry about the size of a *bor* or *jujube* fruit, and is enclosed in a hollow, yellow, dry and papery cover (calyx). It contains a slightly acid pulp with many small flat seeds.

The flavour of the fruit is excellent. Even those who do not care for it very much when they first taste it, come to like it later on. Excellent jam can be made from it. A kind of sweet pickle is also made out of it which, however, does not keep as long as jam does. Many Mohamedans and Bohoris mix this fruit in their preparations of meat. Since the fruit is put to use in various ways, it is expected to become very popular when once its usefulness becomes widely known.

The following information about its culture is, therefore, published for the benefit of cultivators:—

Soil.—The soil need not be very rich, but very poor shallow soils are not suitable. All soils in which brinjals, tomatoes and potatoes thrive are well suited to the Cape Gooseberry also.

Preliminary Preparation of the Land.—The field should be brought into good tilth and manured before the rains. Ridges and furrows five feet apart should be made by means of the plough for purposes of transplanting seedlings.

Manure.—The land should receive 20 to 25 cart-loads of farm yard manure per acre before planting. If the farm yard manure is not good, a topdressing of poudrette (one ton per acre) fish manure or oil cake (800 pounds per acre), or sulphate of ammonia (200 pounds per acre) may be applied at a distance of nine inches from the base of each plant and thoroughly mixed into the soil, when the plants have grown about eighteen inches high.

Seeds—Rate and Seedlings.—In the month of June seed should be sown in lines in seed beds each six feet long and three feet wide. Three such seed beds will give enough seedlings for one acre. One quarter oz. of seed costing 6 annas will give enough seedlings for one acre.

As the seed is very small and as crowded seedlings kill one another, the seed should be mixed with eight times its volume of soil before sowing. The mixture should be sown in lines. The resulting seedlings will grow vigorously and a fair way apart from one another.

Transplanting.—Seedlings are fit for transplanting when nearly nine inches high. The seed bed should be flooded with water the day before lifting the seedlings. On removal they should be kept in a basket in bunches and water sprinkled upon them to prevent drying till required in the field. Two seedlings nine inches apart should be planted in each spot. Each clump of two such seedlings should be five feet apart. The furrows made for the purpose should be well-soaked with running water, some time before commencing actual transplantation.

Irrigation.—Unless there has been a shower or even a drizzling of rain at the time of transplanting, water should be given soon after transplanting. Afterwards the field may be irrigated once in eight to fifteen days according to soil requirements. Any shortage of water-supply after the fruit is set interferes with the proper swelling of the fruit.

Sub-crops.—Some early vegetables may be planted as sub-crops to Cape Gooseberries. Turnips, beet, tomato, lettuce, chillies, knolkhol, palak, or other vegetables may be grown. These crops should be planted so far apart as not to interfere with the operation of ridging up the main plants, which operation has to be done from one to two months after transplanting. Or else the sub-crops should be such as can be harvested before that time.

Ridging up.—This operation which is similar to that for ridging sugar-cane should be done when the plants are about a foot and a half high. The soil between the lines of plants should be dug up and heaped along the lines so that what were originally furrows are now transformed into broad ridges. If enough manure was not incorporated into the land in the beginning it may be mixed with the soil before ridging. Irrigation channels will now be formed between the lines and along each side of them. This operation shelters the roots from any possible exposure to the sun and provides convenient room between the lines to enable easy collection of berries.

Weeding.—It will be necessary to weed the plot a fortnight after planting. Afterwards about two more weeding in the whole period of the crop may be

needed both to stir the soil round the plants and to kill obnoxious herbage.

Pinching.—If the plants present a tendency to grow straight up, their leading shoots should be pinched back, when the plants have grown over a foot high. The plants will then throw side shoots and become spreading and bushy.

Flowering and Fruiting.—Flowers begin to appear with the advent of the cold weather, say about November, and fruits begin to set soon after. At Christmas ripe fruits are available. The best crop of fruits is obtained in January and February. The first two pickings give fruits of excellent flavour and few seeds. The fruits ripening in March are small and very seedy. It is, therefore, not profitable to retain the crop in the field after March. A completely ripe fruit has a very dried up cover and in this condition it often drops on to the ground. The dropped fruit is sweet being fully ripe. This would be the proper condition in which to pick the fruit. But it is not always convenient and economical to do so and it is usually picked from the plants when the cover has turned just light yellow.

Sale.—The fruits must be sold or exported immediately after picking. Otherwise one has to incur loss on account of shrinkage in weight by keeping.

Produce.—Each clump of two plants will yield from 1 to 2 lbs. (or from half a ser to one ser) of fruit. One acre contains 1,750 clumps and, therefore, the yield will come to 900 to 1,700 sers per acre.

Market Price of Fruits in Poona.—The market price of the fruit in the Empress Gardens, Poona, varied in the course of the last fifteen years from 4 to 10 lbs. per rupee according to the demand. In the Poona City market, the wholesale dealer has paid for these fruits at rates which varied from 4 to 10 lbs. per rupee.

Disease.—The Gooseberry has usually very little trouble from any diseases. Occasionally there is an attack of mildew which has rarely done any damage at all. Sometimes a caterpillar is seen cutting the leaves, but it dies away in the cold weather. Rats and civet cats sometimes give trouble.

Altogether we have, in the Cape Gooseberry, a crop which is well worth the attention of progressive cultivators, who have irrigation facilities, and who are near the railway or a good market. Under these circumstances the crop will yield a large return and well repay the attention it demands.

INDUSTRIES AND COMMERCE.

INDIAN AND COTTON COMMITTEE.

Government of India Resolution.

The following resolution has been issued in the Revenue and Agriculture Department:—

In their resolution, dated the 27th September, 1917, the Government of India appointed a committee to investigate the possibilities of extending the growth of long-stapled cotton in India. The terms of reference to the committee were that it should examine the work which had been done in the various provinces in the establishment of long stapled cottons and report regarding the possibility of the extension of any methods which had led to success, that it should investigate the causes of failure where this had occurred and if it found the failure to have been due to agricultural, irrigational or economic causes or to administrative difficulties, that it should propose appropriate remedies. The committee was also instructed to carry out a detailed study of local conditions in each cotton growing tract, to enquire into the possibility of improving existing methods of ginning and marketing and also of preventing adulteration and damping and to report on the possibility of improving the accuracy of the cotton forecasts and generally of making the statistical information published by Government of greater utility to the cotton trade. Finally, the committee was to submit recommendations in regard to the staff required and the organization necessary for the development of the cultivation of long-stapled cottons in tracts which it considered suitable for that purpose.

The committee assembled early in October, 1917, and toured in the cotton growing areas of British India and Indian states for five months. It examined numerous witnesses and in addition to visiting almost all Government farms in the provinces in which cotton is grown, it inspected a large number of ginning and pressing factories and spinning and weaving mills and also held many informal meetings with cultivators, ginneries, brokers, representatives of co-operative societies and other persons concerned with Cotton. The results of these enquiries are embodied in the report which has already been published and of which the Government of India have now completed preliminary examination. Some time must necessarily elapse before the numerous recommendations contained in the report can be dealt with finally but the Government of India desire to take this opportunity of acknowledging the services of Mr. J.

Mackenna, president of the committee and his colleagues and to indicate broadly the lines on which it is proposed that the disposal of their recommendations should proceed.

The Committee has divided its report into two parts, in the first of which it has made a detailed local study of agricultural practice, irrigational development, research and marketing in the various provinces and Indian states.

The recommendations made in this part of the report are mainly a matter for disposal by the local authorities concerned and the Government of India are disposed to confine their intervention to larger matters of general policy or principle and to questions affecting more than one province for the present. The only matters dealt with in this part which the Government of India think it necessary to reserve for further examination are the following:—(a) investigation of the supplies available in the Indus and other Punjab rivers (a separate reference will be made to the Government of the Punjab on this subject) P; (b) the policy of granting to capitalists land on the new canals connected with the Sukkur barrage project; (c) the appointment of an additional mycologist to the staff at Pusa; (d) the imposition of a cess on all cotton used in Indian mills or exported to provide funds for the additional agricultural staff proposed. Should the Government of India find it necessary on further examination, to take up any other matters of general principle a separate reference will be made to the local Governments and administrations concerned. Subject to the above reservations they are prepared to leave to the discretion of local Governments and administrations the adoption of the various recommendations in chapters II-XI of the report, it being understood that a prior reference to the Government of India will be made in all cases which require their sanction under the ordinary financial rules. In particular, they desire that no time may be lost in considering the recommendations of the committee in respect of additional appointments in the agricultural department. They have recently addressed the Secretary of State for India regarding the requirements of the different provinces except Burma, for which no proposals have as yet been received, but their recommendations were submitted prior to their examination of the Cotton Committee's report which proposes the addition of a considerable number of appointments, especially on the botanical side. They, therefore, desire that this matter may be taken up at once by the local Governments and administrations in order that the Secretary of State for India may be asked as soon as possible to sanction such further appointments as may be considered necessary.

The second part of the report is devoted to the commercial side of the problem and comprises in the main recommendations of general application which it will be primarily for the Government of India to deal with. They are, therefore, undertaking a detailed examination of these recommendations in so far as this has not already been done, precedence being given to the proposals in Chapter XIX for the formation of a central cotton committee as in the event of such a committee being instituted, its advice will be of great value in assisting the Government of India in the disposal of the remaining recommendations, particularly those in chapter XVI of the report which is devoted to commercial matters and embodies perhaps the most important and difficult questions which the committee was called upon to investigate. The precedence given to chapter XIX will not, however, preclude the concurrent examinations of the recommendations contained in the other chapters: in particular, the question of licensing, ginning and pressing factories which is suggested in paragraph 225 of the report will be accorded special priority. Some progress has already been made with the proposal for the formation of a central cotton trade association in Bombay, a matter which is dealt with in chapter XVIII. The draft of the scheme foreshadowed in paragraph 255 has been received from Mr. Wadia to whom and to Mr. Glazebrook who collaborated with him, the acknowledgements of the Government of India are particularly due, and pending its detailed scrutiny, a Cotton Contracts Committee has already been set up in Bombay. Local Governments and administrations will be addressed in due course when the Government of India are in a position to place before them their considered views.

BOOKS IN BRIEF.

The Principles of Citizenship.—By Sir Henry Jones. Messrs. Macmillan & Co. Ltd., London and Bombay. 3sh. 6d.

To those who have read Sir Henry Jones' *The Working Faith of a Social Reformer* his present work will not come as a surprise. His standpoint is, as may be guessed ethical in this book and we think rightly so. He, however, does not dogmatize. He suggests rather than propagate his own views. This is just the method that should be adopted in writing on a subject like "Citizenship." The reader's consciousness is awakened and is enabled to think, nay fully led into *thinking*. Sir Henry justly insists that the moral truths which have practical power in a man's life are those which he discovers anew for himself. True citizenship is realized only when the ethical ideas on which it is based are grasped and acted upon. The progress of democracy—true democracy—so much depends on this that it is small wonder that only a citizen of England which is the one country which can successfully point to success in modern political history and Empire building on thoroughly sound ethical lines that can point the way to success in the great experiment of the future citizenship within in a Democracy. The book is likely to prove a great corrective to many mistaken notions about matters of particular moment to this country where the ideas relating to liberty, State interference, natural rights, obligations of State, etc., prevail. We hope that it will attract the attention of the several University Boards of Studies. The book is eminently one fitted for study by students taking Political Science in our Universities.

The New Tariffism.—By the Rt. Hon. T. M. Robertson, M. P. Published by Genge Allen and Unwin Ltd., London. 23'6d. net.

This is a reasoned criticism of the Balfour Committee's Report on the commercial and industrial policy that England should adopt after the War. Since Mr. Robertson wrote preference of a kind has been adopted in England and the Premier has recently promised a kind of protection to key industries. Despite all this, it is clear that opinion in England has been slow in veering round to the extreme views propounded by the Balfour Committee. Mr. Robertson's eloquent plea against its recommendations shows that free trade is not likely to be killed so easily as some people imagine. The prosperity of England has been too long bound up with free trade for the people to give it up easily. We do not think we can recommend a better book than Mr.

Robertson's for a clear understanding of the extreme position taken by the Balfour Committee in regard to certain matters.

Beginnings of South Indian History.—By S. Krishnaswami Aiyangar, M. A. Published by the Modern Printing Works. Rs. 3-12-0.

This contains the substance of the course of special lectures delivered by Mr. Krishnaswami Aiyangar before the Madras University—January and February 1918. It deals with aspects of South Indian History which may be better understood when we note down the chapter headings:—Research in Indian History; The Value of Literature; South India—a Distinct Entity; Mauryan Invasion of South India; The Dawn of the Christian Era; Chronology: Tamil Literature; The Age of Purnas, etc. The value of contributions of this kind cannot be denied, whatever critics might say. Every attempt at elucidation of the dim past of South India,—or India as for the matter of that—ought to be welcomed. Mr. Krishnaswami Aiyangar would be the last to say that what all he writes is either correct or the last word on the subjects on which he has written. But critics should pass lightly over the shortcomings of a work of this sort and see to the light—given the little light—they might shed on the periods to which they relate. The value of publications of this kind lies entirely in the interest they evoke in the subjects to which they relate and the accretion of workers they secure to the field of research. It is easy to be too critical in matters of this kind, but criticism to be of use should, we think, be always helpful and constructive. We will only add one word in regard to the book itself. We would like it to be cast in a less polemical mould. Polemics is good in its own way, own sphere, but in a book of this kind it is, in our opinion, out of place. In revising the book for a future edition it would gain in value if the author rewrote some of the chapters in which the controversial air is far too predominant.

Governance of India.—By K. T. Shah, B.A., B. Sc., Bar-at-law. Published by Ramachandra Govind & Son., Kalbadevi Road, Bombay. Price Rs. 3.

This is a commentary on the Government of India Acts of 1915 and 1916. We rather like the form of this book, though it has certain inconveniences. Professor Shah writes as an Indian publicist and his views, where they differ from those of authorities of high repute, are fair. The commentary to each section or groups of section is clear and the exposition of the principles underlying it or them leaves little to be desired. Professor Shah, we are glad to note, does not, at the same time, spread himself out unnecessarily. The book is, therefore, both readable

and informing. The publishers, Messrs. Ramachanda Govind & Son., deserve praise for their excellent get up.

The Future Government of India.—By K. Vyasa Rao, B.A., Published by Messrs. Macmillan & Co. 12s. net.

The Reforms scheme of Lord Chelmsford and Mr. Montagu has been preceded and followed in India by an amount of propagandist work that is truly phenomenal. In the war of speeches and pamphlets that the occasion has given rise to, very little, perhaps, will remain of permanent use. But despite their ephemeral character, they have sought to influence public opinion one way or the other. This book, however, does not stand in the same category. It, perhaps, might claim a wider set of readers, and when the storm of discussion that is now on has spent itself out, it will still be turned to for useful suggestion. The author says that he has attempted to take up the mechanism (of Government) as it is and has tried to bring out its inherent potentialities, leaving it at the same time responsive to necessary changes in the near future. The book is, therefore, largely constructive in character, though it is fearless in criticism of existing defects. This is as it should be. We note Sir S. Subramania Iyer, has read the proofs of the book and has spoken approvingly of it. He is, perhaps, one of the greatest legal luminaries of India and his opinion ought to carry great weight. When he states that the book is a "contribution" to the subject of Indian Reforms, he is not merely voicing his own opinion but that of many others in this country.

The Sepoy. By Edmund Candler.—John Murray, London. 7sh. 6d.

Mr. Candler deserves to be congratulated on this graphically written book. From cover to cover it is full of human interest. The sixteen different types of Indian soldiers who fought under the British flag in Mesopotamia are pictured for us here. The characteristics of the men, whether as individuals or as fighters, are brought out with Mr. Candler's known skill. It is interesting to recall the fact that the best fighters of India are amongst its best cultivators—producers of material wealth. This fact has again and again been brought home to us as we read this book. The Jat, the Mahratta and many another tribe or caste may be cited. Mr. Candler's descriptive account deserves to be widely read all over the Empire.

RECENT PUBLICATIONS.

The Selection and Training of the Business Executive. By Enoch Burton Gowin. 7½×5½, xiii.+225 pp. Macmillan & Co. 8s. n.

Income-tax. How to Avoid Overcharges and Obtain Repayments. By A. D. Macmillan, formerly surveyor of taxes. 8½×5½, 61 pp. Effingham Wilson.

The Training of a Salesman. By William Maxwell, Vice-President of Thomas A. Edison, Inc. (Lippincott's Training Series.) 7¾×5, 221 pp. Lippincott. 6s. n.

Problems of National Education. By Twelve Scottish Educationists with Prefatory Note by the Right Hon. Robert Munro, K. C., M. P., Secretary for Scotland. Edited by John Clarke. 8¾×5½, 368 pp. Macmillan. 12s. n.

Suggestions of Modern Science Concerning Education. By Herbert S. Jennings, John B. Watson, Adolf Meyer, and William J. Thomas. 7½×5, vii.+211 pp. Macmillan & Co. 5s. 6d. n.

The Measurement of Intelligence. An explanation of and a complete guide for the use of Stanford revision and extension of the Binet-Simon intelligence scale. By Lewis M. Terman. With an introduction by Professor J. J. Findlay. 7½×5½. xi+362 pp. 6s. n.

Test Material for the Measurement of Intelligence. By Lewis M. Terman. 3s. 6d. n. Hanap.

Commercial Forestry in Britain Its Decline and Revival. By E. P. Stabbing. 7½×5½, vi. +186 pp. Murray. 5s. n.

The Safety of the Nation. Showing how our security rests upon our industries. By Jan D. Colvin. 7½×5, xii+241 pp. Murray. 6s. n.

Influenza. A discussion opened by Sir Arthur Newsholme, K. C. B. 10×7, 102 pp. Longmans. 3s. 6d. n.

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MYSORE EDUCATION MEMORANDUM.

BY THE EDITOR.

THE Government of Mysore have extended the time for sending in opinions on their Education Memorandum to the last day of December, 1919. This, we have no doubt, will give ample time to those who wish to study it in full and submit their views. We have already received a few opinions for publication and doubtless will receive more in the next few weeks. We hope to publish what we receive in a fairly connected form in the *Journal*. Those who have not yet sent their views will do well to dwell on matters essentially within their personal knowledge or experience. It is best to be brief so that all that is received may be easily put together and presented in an assimilable form.

In expressing their views, correspondents would do well to concentrate attention on one or two essential points. How far are the reforms suggested in keeping with the past history of education in the State? That is one point. How far are the reforms suggested desirable in themselves as a means to an end? Are the reforms proposed such as to enable us to build anew on sounder and surer foundations? These are other questions for consideration. They should also weigh the proposals well and see how far

they will, if adopted, enable us to fit our children and children's children to fight the future fully equipped. The world that is to be will not be the world that was dead with the War. The new world that is arising has need to take stock of not only what has already been achieved in the past but also to allow a great deal for the interplay of cause and effect. The War has wrought radical changes in many directions, not least, on the social fabric everywhere. Its lessons cannot be ignored in any sphere of life, least of all in that of education. As a recent writer remarks:—

“Of the social institutions educational systems have for the first time received attention commensurate with their importance, for education is among the strongest influences which make a man what he is, and in education more than in any other factor lies the hope of the world. Especially have the systems of England and Germany been compared. The two differ in almost every respect. German education is systematised, intelligible and admittedly efficient. English education is apparently chaotic yet also effective in its own way. Which is the better system? By what educational machinery has Germany installed in her people the blind faith in a cause that has aligned the world against her? By what system has England trained her young men for leadership? Similar queries arise when any of the belligerent countries is considered. How has France schooled her sons to such

courage and devotion as have astounded the world? How does the United States solve the question of democratic education? From comparisons such as these inevitably must follow the conclusion that an educational system is something more than a mere organization for importing knowledge to the rising generation. More adequately than any other phase of national life an educational system expresses the innermost beliefs, ideals, and aspirations of a people.

* * * *

Educational systems differ from each other by reason of a number of factors—historical, geographical, ethnological, political and economic. But more surely and fixedly than these the theory of the state and society held by a people determines the character of its educational institutions.”

Critics would do well to ponder these words, if they desire to make a fruitful contribution to the discussion. The details of educational practice may change from time to time, but the basic principles on which education in any country rests change so slowly that it is of the utmost importance to approach it with becoming grace. Every country has developed according to its genius. Germany is an instance of centralization under absolute control; France is an example of centralization under popular control; England illustrates in her system the principles of individualism and initiative; the United States embodies the hopes of a democracy; Canada typifies a country building up an educational system under pioneering conditions of development; and Denmark stands for the conscious adaptation of an educational system to the needs of an agricultural community. How far can any of these systems be upheld for imitation? And what is the place of imitation in matters educational? Education, as the writer we have quoted above, well brings out, is too vital a part of the social organism to be transplanted or grafted. Much of great value may be gleaned from a study of foreign systems, but any wholesale adoption of any of them is not likely to make for progress in a country with social, political and economic antecedents of a character entirely different from those of the country it borrows from. Each country must try to evolve its own system, in keeping with its history and ideals.

TECHNICAL COURSES OF INSTRUCTION IN HIGH SCHOOLS.

A very great change has come over the conception of Education which is now made to include Vocational training also as being as cultural as training in purely literary pursuits. Observation, collection and classification of data, reasoning upon them and applying the conclusions for the promotion of Industries, Commerce and healthy means of livelihood and national efficiency are considered to be no less cultural than a study of history and philosophy. They have the same humanistic value inasmuch as their object is service to society through self-help and the capacity for helpfulness.

In addition to their cultural value they have the directly utilitarian aim of promoting the Industrial and Commercial efficiency of a people which in these days of keen international competition must be regarded as an indispensable object of every educational system.

That a purely literary education has its defects some of which are of a serious character has been recognised by the experience not merely of India but of the west as well though the problem does not present itself in so acute a form there. In the report of the Royal Commission on Industrial Education appointed by the Government of Canada in 1910, occur the following passages which cannot be without interest to Indian educationists: “Educational work was becoming bookish in the extreme and worse than that was developed into a school system that had few points of contact with Industrial, Agricultural and House-keeping life.” “A new country needs the constructive and conquering qualities as well as sedentary, absorbing, remembering capacity.” The Commission looked forward to a

*A note submitted to the Government of Mysore by the Inspector-General of Education in Mysore.

time "when arts will be acquired joyfully instead of painfully, reluctantly and with difficulty as separate school subjects." "Industrial training and Technical Education serve to supplement general education and give to it a finishing course of experiences with special reference to the requirements of the workers in industries, agriculture, housekeeping, commerce, transportation, mining and other occupations." The significance of which passage is that general education without industrial and technical training cannot be considered to be complete. It is only a partial education which has to be supplemented by other courses before the individual could be said to have received the full development that his nature is capable of. Further "in the opinion of the Commission it is important that from twelve years of age and onward the general and cultural education should *include* adequate vocational education." It is precisely this *inclusion* that the present Memorandum aims at achieving.

Of even more importance are the report and conclusions of the Committee of the N. E. A. of the United States published in 1910, which show how the old distinction between the general school and the technical school should be done away with and the two types synthesized into one complex whole. After defining the manual training High School as one in which a greater or less amount of handwork is taken up and in which the greater part of the academic instruction is like that found in other High Schools, and the technical High School as one in which the Technical side is emphasised while the general side is not absent either, the report of this Committee proceeds to show that technical High Schools however "usually form elective departments of High Schools: not many have been separately established. Moreover there are few either schools or departments to which the definition of Manual Training High School

can be properly applied. Most have an outlook more or less industrial." In his interesting book on Education for Industrial purposes, Mr. Seath points out "At first Manual Training was advocated for the Grammar and High Schools on purely cultural grounds. During the last four or five years however as a result of the growing emphasis on the social side of education the conception of Manual Training in the Grammar Schools has come more and more to be that of an educative instrument interpreting the fields of art and industry in terms adapted to the life of the child and the limitations of the school" which shows that the country which did so much to promote Sloyd is now leaving Sloyd behind.

The following quotations from Mr. Seath's book will serve to illustrate the principle and practice that are advocated in this Memorandum. "Wisconsin has also provided for the establishment and maintenance of departments of Manual training (note Departments not separate schools) in High Schools and in the Upper grades of the Grammar Schools.

Perhaps the most decisive pronouncement on this subject is to be found in the report of the Massachusetts Commission on Industrial Education which has been described by Mr. Seath as "at present the most potent factor in the reorganization of Industrial training of the United States." Mr. Seath continues: "Its conclusions and recommendations are well worth the serious consideration of the people of Ontario; in my judgment they apply *mutatis mutandis* to Ontario as well." I might add to Mysore too with appropriate modifications. The following paragraphs reproduced *verbatim* will, it is hoped, be of decisive influence in this discussion.

"The Industries of Massachussets need, in addition to the general intelligence furnished by the public school system and the skill gained in the narrow fields of sub-divided labour, a broader training in the principles of

the trades and a finer culture in taste as applied to material, workmanship and design. Whatever may be the cost of such training the failure to furnish it would, in the end, be more costly.

"The State needs a wider diffusion of industrial intelligence as a foundation for the highest technical success, and this can be acquired only in connection with the general system of education, into which it should enter as an integral part from the beginning.

"The investigation has shown the increasing necessity for a woman to enter the industrial world for the sake of self-support, and hence that she should be prepared to earn a respectable living wage, and at the same time that the attempt should be to fit her so that she can and will enter those industries which are most closely allied to the home.

"The investigation has shown that the vocation in which all other women's vocations have their root, namely, the care of the home, has been overlooked in the modern system of education. In order that the industrial life of the community may be vigorous and progressive, the housekeepers need to be instructed in the laws of sanitation, in the purchase, preparation and care of food, and in the care of children, that the home may be a home and not merely a house."

RECOMMENDATIONS.

"That cities and towns so modify the work in the Elementary Schools as to include for boys and girls instruction and practice in the elements of productive industry, including agriculture, and the mechanic and domestic arts, and that this instruction be of such a character as to secure from it the highest cultural as well as the highest industrial value; and

"That the work in the High Schools be modified so that the instruction in mathematics, the sciences, and drawing shall show the application and use of these subjects in industrial life, with especial reference to

local industries, so that the students may see that these subjects are not designated primarily and solely for academic purposes, but that they may be utilised for the purpose of practical life; that is, algebra and geometry should be so taught in the Public Schools as to show their relations to construction; botany to horticulture and agriculture; chemistry to agriculture, manufactures and domestic sciences; and drawing to every form of industry.

"The Commission also recommends:—

1. That all towns and cities provide by *new elective industrial courses in High Schools* instruction in the principles of agriculture and the domestic and mechanic arts;
2. That in addition to day courses cities and towns provide evening courses for persons already employed in trades; and
3. That provision be made for the instruction in part time day classes of children between the ages of 14 and 18 years who may be employed during the remainder of the day, to the end that instruction in the principles and the practice of the arts may go together"

After so clear a statement of the case there is no need to say more except to emphasise the means suggested as proper for the achievement of the object in view, namely, the provision of new elective industrial courses in High Schools. Elective industrial courses in High Schools are precisely the reform suggested in this Memorandum.

To give a concrete instance of the type of institution that would result from the application of these principles, reference may be made to the Springfield Technical High School in which there are three courses—a General course which is compulsory for all and specialised courses for general culture, scientific studies and commercial and industrial pursuits. It provides that "in

all the courses without exception the boys shall take drawing and shop work and the girls sewing and cookery." There has been much debate in Mysore whether if Industrial courses are introduced it should be made obligatory on all to take some one course or another, whether they intend to specialise on the industrial side or not. The answer of Massachusetts seems to be in the affirmative.

That a combination of general education and vocational instruction is necessary is proved by the universal experience of Europe as well. In the London Trade Schools even, 8 hours are given to English and general studies, 8 to 10 hours to Mathematics and science and 8 to 10 hours to drawing and Manual work.

In some of the French Schools the Trade Courses are both theoretical and practical. The theoretical include French language and literature, History and Mathematics, science, music and gymnastics. General courses are in some places held in the forenoon and the Trade courses in the afternoon.

There is no need to multiply instances and the discussion of the project in hand may now proceed with reference to local conditions and needs.

The general disinclination and debility shown by educated Indians towards manual pursuits has given rise occasionally to the view and since education has had a paralysing effect on physical and practical activities, it would be better to organize industrial schools as separate institutions unconnected with the general schools and give in them little or no general education so that the evils which are supposed to result from general education may be altogether avoided. Thinkers of this school seem to be of opinion that whether it is desirable or not, it is necessary, in view of the peculiarities of Indian character and temperament to wean away those who are to spend their lives as Industrial workers from general education. On this view the Technical schools will be

purely practical institutions in the programme of which general culture will not be included or will be included only to a very small extent. The general schools will continue to be what they are at present, because on their hypothesis general education and manual occupation are incompatible with each other. There is therefore no sense in introducing technical courses in general institutions in which they can never take root and flourish.

If this view is accepted as correct it would result in the production of two classes of men, one possessing general culture and capable of taking part in public life and administration, but utterly useless for industrial occupations; and the other, the industrial workers and the tillers of the soil who will not be capable of exercising through lack of education the influence that is generally regarded as necessary for the welfare of the State on public life and administration. The antithesis between the educated man and the industrial worker is an admitted evil and unless their reconciliation is considered to be absolutely impossible, every means that has even a small promise of success should be tried in the interest of the people at large and of the State. If it is held that progress is in the direction of democracy such a reconciliation must be attempted at all cost as otherwise the masses would be unfit to discharge the functions that may devolve upon them.

But in point of fact the very principle of the above argument is vitiated by a serious fallacy. The fallacy, namely, that because the *present* system of education has produced a distaste and a disability for manual work, therefore education *as such* will produce the same consequences. It does not seem to have struck thinkers of this school that if the very system of education given is changed and manual occupation suited to the different grades and ages grafted on it right from the beginning, the dissociation between education and manual occupations could not only be avoided, but that education could be made,

as thus reformed, an active agent for bringing about happy association between the two. If it is true that the present mode or type of education has not promoted but rather retarded the love and capacity for physical labour, then it is a very good reason why the present system should be modified and no reason at all why the industrialist should be consigned to ignorance or to a culture of very inferior type.

Such a modification of education is rendered absolutely imperative by the introduction of compulsory education. If it is true that education has a paralysing effect on the hand than since the majority have to live by the toil of their hands in field, factory and workshops, there would be no justification for compelling them to get educated unless the education given be of a type that would not be antagonistic to their careers as workers. If it is argued that compulsory education obtains only in regard to elementary education, the answer is that an elementary education which does not leap up to and which is not intended to lead up to secondary education is a questionable gift which can have no place in a system of co-ordinated stages of education. It therefore follows that in future the introduction of vocational, industrial courses not merely in separate schools but as a part, elective or compulsory, of the general education given in the State is desirable and necessary.

It may be said that if such courses are introduced very few would take to them. Prophecies of this kind must be put to the test before they could be believed in. Personally speaking after much direct experience of the inclination and capacity of the youth of our country, I have come to the conclusion that Indian youths who are not, in youth, before the environment has produced all its effects for good or bad, very different from youth elsewhere, will take as readily and greedily to manual occupations and technical education as the youth of any other country in the world. Human nature is

more nearly the same everywhere in infancy and youth than it is at a later stage of life; and there is no need either on the ground of experience or psychology to take an unduly pessimistic view of the potentialities of the youth of our own country.

In one respect the proposals submitted in this Memorandum have already been accepted in principle and embodied in our regulations. Nothing more novel is proposed here than giving them life and reality, adopting ways and means by which the theoretical recognition would be translated into fact and actuality.

Industries and agriculture are at present included under division C of the subjects which would be taken for the S. S. L. C. course. As division C does not lead up to the University course it has never been and never could be popular. Youth is ambitious and no educationist, no man with a heart could expect youth to choose subject which limits its careers to a High School certificate while other vistas are stretching before its eager vision. What is proposed therefore is the transference of these subjects from the C to the B Category.

That such a translation will at once attract a large number of students is proved by what has happened this year in respect to commerce. Commerce was till a year ago in division C and not many took up that course. This year under orders of Government it was transferred to division B—the division that leads up to a University Course; and though the classes were opened some time after the schools were opened and got into working order, more than 200 students have joined these classes.

Pedagogics though still in Division C has attracted over 80 men as soon as provision was made this year to teach the course. "C" Courses should be discouraged and avoided as they involve overtime work and are injurious to the health and mental development of pupils in adolescence when they

should not be given too much of sedentary work or studies. However these facts are enough to disprove the allegation that educated Indian youths have a constitutional repugnance for professional and vocational courses.

The S. S. L. C. course as it stands now does embody the principle and policies here recommended, but in an unsystematic and uncoordinated manner. Moreover there is very little scope even now for the play of expending physical energy of the adolescent boy and no variation from purely intellectual pursuit worth the name has been so far secured. This as the discussions above have revealed is the cardinal problem of education, and unless this is solved no approach could be said to have been made towards that ideal of education in which the cultural and the practical will shine in happy conjunction shedding a healthful ray on the path of national progress.

The remedy is believed to be the provision of courses of study which will rouse and sustain interest while from their nature and correlation of mental and physical faculties will be automatically secured. Such courses must necessarily include a great deal of hand work in specially equipped training rooms and must be devised so as to provide enough choice to the more muscular of our students, who either from inclination or defect cannot be expected to reach the same high standard of purely intellectual work, as the more bookish of their fellow students.

While thus depriving the more muscular students of the chance of learning work to their taste, the existing courses of study create in so called success too, a studied indifference, if not antipathy to a mechanical turn of mind, which under present day conditions of industrial development and general advancement, shuts them out from an intelligent participation in affairs that should have a natural claim on their attention and interest as men of culture. Such an outlook can be developed only when they are under training

in the schools, and when such training includes a handling of tools associated with an industry adapted to the particular locality.

If these ideas be kindly accepted by Government and the effective inclusion of industrial subjects in the general educational courses conceded as it has already been in theory, the next point for consideration would be the stage at which the student should start such work in view of the level of knowledge and physical development required. Industrial training of any kind presupposes a definite stage of muscular development, the primary factor involved in the manipulation of tools, and the minimum age, in the case of Indian students may be fixed at thirteen or fourteen. Before this age, they are not generally developed enough to take to such work except agriculture and gardening, without overstraining themselves, and in addition to the general standard of knowledge also attained will not enable them to follow intelligently the line of thought underlying the processes taught in the workshops.

In respect to the age at which industrial training properly so called should be commenced the practice and precedents of foreign countries are conclusive. In England it is from 12 to 14 years of age in what are called elementary institutions which really correspond to our Lower Secondary grades. The London Technical Day School—Minimum age over 12 years; Liverpool Day Technical school—Minimum age not less than 13; Scotland 12 to 14; France 12 to 13, Switzerland generally 13; and Berne 14.

As was pointed out in this office No. D. O. 23 dated 9th July, 1911, dealing with Agricultural Education in the Lower Secondary Schools manual occupation will not be altogether unprovided for even in the Lower stages. A good system of kindergarten, school gardens and agriculture would give sufficient occupation for the younger pupils and serve to keep their body and muscles in tone. As has been pointed out by the Industrial Commission of Canada, in the lowest

grades, in order to prevent the capacity for Industrial pursuits from suffering attrition and to give a fuller development to such capacity as is innate, the following provisions should be adopted.—Nature study and experimental science, free vocational work, organized and supervised play and game, more and better singing, paper folding, clay modelling, school gardening and other manual occupations. In the Lower Secondary grades in all rural schools Agriculture may be introduced and in the City schools some alternative for agriculture in the shape of practical instruction classes may be organized. But if agriculture and practical instruction should become an organic part of the educational system the present Lower Secondary curricula will have to be revised and consolidated. To continue to keep practical agriculture and practical instruction as extras which may or may not be attended to is to place them at a discount and to render them less popular than they would otherwise be. If Government approve of this idea a detailed scheme which is now under consideration will be formulated and submitted. The present memorandum deals only with the High School courses.

Technical instruction properly so called should first be attempted in the High School courses, and the S. S. L. C. scheme still further broadened out so as to include industrial subjects also. The question would arise here of the desirability or otherwise of making the industrial training compulsory in the case of every pupil in the High School course, and this must be decided by considerations of economy and of efficient administration. Economy, because when compulsion is introduced the equipment and the teaching staff and materials will be utilized to their fullest capacity and the net cost to Government per student of such training will then be least. Secondly, a greater range of subjects can be organized, as when all the students have to take up an industrial subject, different aptitudes have to be met

differently. Thirdly, the enthusiasm of the teaching staff will be sustained, as there will be a sufficient number of students in each branch of industry, which will not be the case when such studies are made optional.

No possible objection to such a course would come either from the pupils or the parents of pupils inasmuch as Sloyd is now compulsory, in place of which and for the hours now given to it an industrial subject will be introduced. Aided institutions which may not be able to provide for such varied equipment as this, would have to be given larger grants. However until the idea of compulsion is found to be agreeable, the subjects of study for the S. S. L. C. may be regrouped and widened out as shown below :—

COMPULSORY SUBJECTS

1. English.
2. Vernacular
3. Mathematics (Elementary)
4. Indian History and Geography
5. Elementary Science

OPTIONAL SUBJECTS

1. English History and Commerce
2. English History and Economics
3. English History and Sanskrit or Persian
4. Physics, Chemistry and Natural Science and Mathematics
5. Agriculture and Sericulture
6. Industries, one of the following :—
 - (a) Carpentry and Cabinet making
 - (b) Smithy
 - (c) Machine shop and fitter's work
 - (d) Pattern making and Foundry work
 - (e) Printing and Book-binding
 - (f) Weaving
7. Pedagogics and part of the above groups.

It is estimated that at least five hours will have to be devoted every week, for the three years of the High School course, for successful and profitable instruction in any of the

Industrial subjects. Such a provision does not make any very serious inroad into the total time available for the entire High School course.

Separate subjects, suitable to lady students will have to be provided, but considering the number of such students in the schools, it will be a mere matter of detail and could be arranged for when necessary.

It will be noticed that the scheme as presented here does not in the slightest prevent the student who has a natural aptitude and inclination only for what are called subjects of general interest from specialising in that line and going up to the University for the humanities or pure sciences. What little compulsion of a vocational character is here recommended is recommended purely as an alternative to Sloyd which is now obligatory on all students though in point of fact owing to lack of facilities a good percentage of them get little or no Sloyd practice. The basic principles of the existing system of High School Education remain intact and unimpaired; only other course are introduced and left to the option of the students which cannot be regarded as in any way

cramping their choice or hindering general culture. In fact the charge of cramping choice lies against the system as it is in operation now. The student under existing conditions has little or no choice except to consign himself to general culture and its disutilities if he desires to have a chance of going up to the University.

The cost of including such instruction in the general scheme of the S. S. L. C. will naturally depend upon the locality, the strength of pupils in attendance and the industries taught. Such cost is usually made up of charges under the head of (1) building, *i.e.*, workshops and practising rooms, (2) equipment, (3) teaching staff, (4) materials for work. Of these the first two would be non-recurring and the last three recurring charges. It is usual in framing estimates to assume that a dozen students is the maximum number that a teacher of industrial subject can conveniently teach and supervise, and figures are given on the assumed attendance of 12 pupils at a time. The most costly of the subjects will be machine shop and fitters' work and the least costly will be carpentry and cabinet making.

Table of maximum and minimum Charges for 12 pupils (at a time.)

Machine Shop				Carpentry and Cabinet-making
<i>Non-recurring—</i>				
1. Building	...	...	3,000	1,500
2. Equipment	...	...	...	5,000
(a) For chipping and filling	...	...	1,000	...
(b) Machine work	...	...	8,000	...
(c) Tools	...	...	2,000	...
<i>Recurring—</i>				
3. Subordinate teaching staff	...	...	120 per month	100
4. Materials	...	...	(Depend altogether on the locality)	...
5. Tool replacement	...	...	100 about would be fair	50

The total cost of the introduction of industrial optionals in the High School courses will depend on the number of industrial subjects to be taught at each High School. The following tentative distribution of industrial optionals is proposed for each centre, though it is not intended to open all the courses immediately or at the same time:—

Distribution of Industrial subjects according to locality	Name of centre	Nos. of Industrial optionals proposed
	Bangalore	a to f (vide list on page 14)
	Mysore	do
	Channapatna	a to d
	Hassan	do
	Chikmagalore	do
	Kolar	do
	Chitaldrug	do
	Chikballapur	do
	Shimoga	do
	Tumkur	do
	Davangere	do & f

An average cost has been assumed of Rs. 3,000 for a work room for each industry and of Rs. 7,000 for equipment under non-recurring expenditure.

In framing the estimate of recurring expenditure on account of such instruction, two important points have to be considered. The first refers to the question of the efficient supervision of such instruction, until the whole scheme is systematized and we may have to employ as Head-masters at any rate for the two most important High Schools at Bangalore and Mysore persons with sufficient qualifications and experience of such work elsewhere. We may perhaps have to import men from England, who had been supervising such instruction in the more important Polytechnic Institutes, and we may have to pay each of these a substantive pay of Rs. 500 rising to Rs. 700 in the course of five years, the period for which we would contract for their services.

If the Government are pleased to accept such an arrangement, I may be permitted to address the Board of Education in England and my academic friends for suitable candidates, and for the details of pay and service that they would recommend as suitable. It may be assumed for the purposes of calculation, an average salary of Rs. 600 per mensem for each of the two Head-masters under reference will be required.

There would then remain the question of charges on account of the subordinate staff and of the materials for work and replacement of tools. It is believed that an expenditure of Rs. 120 per mensem would have to be incurred for the subordinate teaching staff for each of the Industries taught, and of Rs. 80 per mensem on an average for materials and tool replacement. These figures are based upon an assumed strength of 50 boys in each class of the High Schools and no difficulty is anticipated in the drawing

up of the actual time tables and work distribution. The instruction in industrial subjects is proposed to be imparted during the afternoon hours, when it will be possible for the work in the shops to be continued beyond the duration of the normal school day without encroachment upon the hours to be devoted to other objects.

As outlined in the table above there would have to be provided (2×6 plus 8×4 plus 1×5) 49 Industrial optionals, at an estimated cost of a non-recurring expenditure of Rs. 4,90,000 and a recurring annual expenditure of Rs. $49 \times 12 \times 200$ or 1,17,600 on materials and subordinate staff, and of $2 \times 600 \times 12$ or Rs. 14,400 on the two important Head-masters, or a total of Rs. 1,32,000 per annum.

The actual expenditure on the ten existing High Schools with their general educational subjects only totalled in 1916--17 to Rs. 1,35,645 and it will be seen that when this scheme comes into operation and is in *full swing* the recurring expenditure would be only doubled. It will be no exaggeration to say that the wider outlook created in those under instruction by such training and the economic value to the State of the finished products of such a system would far outweigh the extra expenditure incurred, and would go a very great way towards creating the necessary industrial atmosphere, which is usually associated with all the advanced countries of the West, and which affords the very breath of life for every kind of successful industrial enterprise.

These classes may also serve the purpose of continuation centres. There is nothing in the scheme outlined above to preclude the possibility of full time boys who are not in attendance at the High Schools taking advantage of the courses of instruction offered, and it would follow as a natural consequence that when the system proposed is worked to its full capacity, the District Head-quarter Industrial School now run as a separate unit, will all be absorbed in the new type of

Polytechnic High Schools and the funds now separately budgetted for these schools will be made available for and merged into those of High Schools. Also evening classes may be held.

This scheme will constitute the first attempt to unify and expand Secondary Education on an unprecedented scale in the State, for, while on the one hand, it will tempt pupils of enormously varied aptitudes into joining and benefitting by the type of schools proposed, it will on the other hand by the consolidation of types, help to evolve an uniformity and integration which will guarantee efficient inspection and a steady and watchful programme of development.

With the enormous expansion in education achieved in recent years it has become incumbent on the State to increase the accommodation in the High Schools. Government are aware how constant demands are pouring in from different quarters for starting new High Schools. More than ever the State is confronted with the problem whether it would multiply the present type of schools and with them be responsible for a large increase in the number of men who are sent out every year with general education which either does not fit them or ill-fits them for the struggle for existence or whether Government would take advantage of a situation wittingly or un-wittingly created to secure the increased accommodation required by introducing a fruitful variation of courses which would not only absorb the students who pass out of the Lower Secondary grade but enable a large number of them to fit themselves for life during their Upper Secondary career. It cannot be too strongly emphasized that the key to the educational organization and the general life of every community is the Secondary School which is best represented in India by the High School. This is the great lesson of Mr. Fisher's recent reforms. It can be seen why the Secondary School is the centre of educational and national interest. The primary pupil is dependent on the parent for his livelihood.

When he leaves school he goes back to the parental roof and is not expected to be in a position to earn an independent livelihood. The High School graduate is enough of a boy to be able to pursue higher courses of study and enough of a man to be free from dependence on the parent and to start on an independent career. There is no exaggeration in saying that the complexion of the secondary school determines the complexion of the country. I can here enter on a discussion of the part played by the secondary schools in the different countries in Europe and what lessons they have for us, but the foregoing ideas and suggestions are, I feel, adequate for the purpose in hand. The secondary school should be a preparation for every variety of manhood's tasks and duties. It should therefore be of the complex type here advocated and should cease to mould students on that narrow and monotonous pattern which has brought on the educated men of our country so many troubles and so much of just reproach.

If Government are pleased to accord their sanction to the scheme, details of the working plan to be adopted in the case of each individual High School to be brought under its operation will be prepared and submitted without delay.

I append the proceedings of a Sub-Committee of the Education Committee which show how expert opinion in the State welcomes this solution of a problem fraught with momentous consequences to our State.

The cost of opening Agricultural and Sericultural classes will be worked out separately in consultation with the Agricultural Department and a detailed scheme submitted. The organization of an Agricultural faculty in the University commits Government to the proper and prior organization of the introductory courses in the High Schools, as otherwise the Educational system of the State will lack co-ordination and integration. Government have held out a hope of sanctioning the proposals of the Department for opening Agricultural classes in the Lower Secondary stages and sanctioned arrangements for the training of the necessary number of teachers; if Agriculture is included in the Lower Secondary and University stages it will have to be included in the intervening stages as well to prevent a gap, for which no justification could be adduced, being formed.

WHAT IS EDUCATION? ¹

BY PRINCIPAL LAURIE,

Heriot Watt College.

THE special department of education with which I am most familiar is that of the application of science to industrial problems from the scientific expert to the skilled artisan, which is generally covered by the description "technical education." As a result of my experience in this sphere I am strongly opposed to the recent expressions of opinion in favour of what is called vocational education.

The country is beginning to realise the extent to which it has neglected the training of the scientific and technical expert, and is now trying to devise a method of doing this on the cheap by robbing some of the valuable years when a boy spends at school, for the purpose of specialised scientific and technical training, which should be left over until the boy is older. There seems also to be a delusion that in doing this we are following the practice to be found in Germany. In Germany it has been the custom to keep a boy at school until he is at least eighteen before admitting him either to a university or to one of the technical Hochschulen and to keep his education up to that age on broad general lines. Even in the Realschule, which is supposed to be specially devised for boys who are going to enter the technical colleges, there is nothing that can be called vocational training.

It is also a mistake to suppose that much time is devoted to the teaching of science to boys in Germany. The science teaching is very largely mathematical, and Germany has not wasted enormous sums of money urgently required for the purpose of providing efficient laboratories in the universities and technical colleges, on school laboratories nor

¹With acknowledgments to the (Scottish) *Despatch*.

are the educational authorities in Germany in favour of the waste of so much time in school laboratory teaching.

WASTED SCHOOL BOYS.

If we wish to find a perfect example of vocational education we must look back to the days of primitive man when the child's education was vocational from the moment he was able to walk and speak, and the result of the vocational training was the primeval savage. To the extent to which the child's education has ceased to be vocational, and has been devoted to the general development of the child intellect, has civilization progressed.

Most of the time spent in the laboratory in modern schools by children under sixteen is wasted. The school laboratory should be more in the nature of a workshop, and the pupil should be made to construct in most cases his own apparatus, and then be made to note not only the extent to which he can get results, but also the limits of accuracy obtainable with such simple apparatus. If members of school boards would visit South Kensington Museum and inspect there the apparatus designed many years ago by Professor Guthrie for use in schools, they would realise that they could save the greater part of their apparatus account, while at the same time improving the educational value of the instruction given.

Attempts have been made to obtain from scientific teaching an intellectual training for the child. Speaking broadly, these attempts have failed. The natural tendency of the child mind, just as it is the natural tendency of the adult mind, is to avoid the painful process of thinking, and substitute the easier road of memory.

INSTRUCTION IN THINKING.

School-masters have always been told it is their business to train the child's thinking capacity, but they are not told how this is to be done, and the proposal to do it by means of the heuristic method in science teaching

is simply a fraud upon the public. If a child were really meant to re-discover, let us say, the composition of water, he would require the brain of a Cavendish to accomplish it.

On the other hand, the school-master has had, and has used for generation, two absolutely certain methods of compelling the child to think. One is to set him down to solve a "rider" or an original proposition based upon his knowledge of geometry. Here the child must think and must understand, and no memory will help him. The other and equally effective method is to set him to turn a piece of English into Latin prose. It is difficult to devise any other method which can be relied upon infallibly to compel the child to think without any possible escape.

Every child should be given an intelligent knowledge of the more obvious facts of nature which are coming constantly under his observation: the simpler facts of botany; the sun, moon, and stars; wind, clouds, and rain; and the simple obvious geological facts to be seen on the surface of the earth, all of which may be defined as nature knowledge.

The courses of science at present given in the Scotch Higher Grade Schools are quite unimaginative, and are of doubtful educational value. What is the use of wasting the time of a child in making a series of experiments to prove the relation between the pressure and the volume of a gas, an experiment for the verification of what is known as Boyle's Law. After all, a knowledge of Boyle's Law is not essential to salvation.

UNDEMOCRATIC.

If the Scotch Education Department made an elementary knowledge of science compulsory for the Leaving Certificate there would be a good deal to be said in favour of such a decision, but the present system of compelling every immature child to learn the

elements of science for the intermediate Certificate, a large number of whom never continue their studies, and in the course of a year or two have forgotten what they were taught, is a waste of public money.

There is another aspect of this vocation school idea. It is essentially undemocratic. It means that at the age of 12 every child's future is to be finally fixed. Unless he can pass certain examination tests his general education is to cease, and he is to be trained merely as a hewer of wood and drawer of water. In future the community is to be divided into two classes—and this division is to take place at the age of 12—the class that is to receive the benefit of a general education and those others that are to be condemned to cease their general education. This division of society into two classes is to depend on the verdict of a school-master or Government inspector. The able brain is often the slowly growing brain. How many of the able men of to-day in business or affairs could have passed the school-master's test at the age of 12? How many of the school-master's pet clever boys ever come to anything? This is what some people call giving equal opportunities to all.

Continue the general education of a child on broad fundamental lines until the age of 15, no matter what class of society that child happens to be born into, and, in the case of the more capable child, until the age of 18 is reached, which is quite early enough for technical specialization. All that is necessary besides proper grading according to the child's ability is to make the courses of instruction sufficiently elastic to encourage any special aptitude the child may develop for art or science, literature or handicraft the indulgence of this aptitude being made a reward for faithful work in less congenial subjects.

AGRICULTURE IN MYSORE, 1917-18.

BY "RUSTICUS."

THE progress made by the Agricultural Department can, in the case of most British Provinces, be measured to a large extent by the work it has done on one or two crops, jute and rice, for example, in Bengal, wheat and cotton in the Punjab or the United Provinces and rice and cotton in Madras. Mysore has no one outstanding crop and the Report of its Agricultural Department, interesting as it always is, suffers to a certain extent from this as it is bound to be a record of many miscellaneous activities. We agree with the Government review in thinking that it is not always possible to see the wood for the trees and that it would be of material assistance in this respect if each section of the Report were prefaced by a brief account of the outstanding results achieved during the year, which could then be followed by a detailed description of the work done in the divisions and districts.

Whilst some good work was done on the farms at Hebbal and Marthur, the new farms at Babbur and Naganahalli have not made a very auspicious start. In both cases, there was very great difficulty in obtaining labour, an obstacle to the development of the farms which should perhaps have been foreseen before the sites for them were selected. No work of any value can be done at Naganahalli until irrigation facilities are provided and there seems to be considerable uncertainty as to when these will be forthcoming. The delay is specially unfortunate as the primary object of this farm is the demonstration of improved methods of sugar-cane cultivation and sugar-cane is the last crop that could be grown without irrigation. Both at Hebbal and Marthur, the result o

the experiments was to confirm those of previous years, which is always satisfactory as it means that valuable time has not been lost. In both cases, it was again established that Red Mauritius cane is the best suited to Mysore conditions, though elephant cane is a heavier yielder at Marthur. Its size, however, renders crushing difficult. The three recommendations regarding the cultivation of sugar-cane which were made by Dr. Coleman in last year's Report are repeated this year and the example may be followed here. They are that the substitution of Red Mauritius cane for the varieties ordinarily grown will give an increase of 10 to 25 per cent per acre in the yield, that the use of oil cake at the rate of at least 100 pounds of nitrogen to the acre will give a net increase in value of over three times the cost of the manure which will be greatly increased by the use of double the amount, and that sugar-cane should not be planted in rows less than two feet apart, planting three feet apart being even better, if adequate supplies of manure are available. Next to the work on sugar-cane, that on ragi was the most important at Hebhal. Selected strains have now been evolved and seed sufficient to sow 1,000 acres has been distributed. On both farms, work on paddy was continued but this has not advanced far enough to enable seed of any improved strains to be given out.

The most striking feature of the district work of the Department was the development of sugar-cane cultivation. It is eminently satisfactory to find that Mysore can play a not unimportant part in reducing India's dependence on foreign countries for sugar. Over 60,000 sets of Red Mauritius cane were distributed in the Eastern Division and over $7\frac{1}{2}$ lakhs of sets of foreign canes in the Western Division. The varieties distributed in the Western Division are not stated but presumably Red Mauritius was the most important, if not the only one. The figures sound imposing enough and undoubtedly

mark a great extension but as the number of sets necessary for an acre is not mentioned, it is impossible to estimate their real significance. That cultivators are becoming increasingly alive to the importance of using suitable manures for sugar-cane is shown by the fact that 720 tons of ground-nut cake were distributed in spite of its high cost.

A point to which the Agricultural Department in Mysore has always paid special attention has been the popularization of improved implements. Work in that direction has been greatly hampered by difficulties in obtaining the implements themselves and spare parts and by difficulties in transporting them where they are obtainable, owing to the restriction of railway facilities. However, 467 ploughs and 51 cultivators were sold in the Eastern Division and 719 ploughs in the Western Division. Unfortunately, the Public Works Departments was unable to come to the assistance of the Agricultural Department in developing this branch of the latter's work. The new Bar share ploughs it manufactured proved unpopular on account of their weight and lack of finish whilst most of the sugar-cane mills developed serious defects and had to be taken back. The interesting suggestion is put forward in the Report that Government should establish a factory for the manufacture of agricultural implements. This seems attractive at first sight but we doubt whether such a factory would be a sound economic proposition. In order to be a success, it would be necessary for it to work on a large scale and large scale industries are seldom run satisfactorily as State concerns. It would undoubtedly be a good thing if agricultural machinery could be manufactured in large quantities in this country and it is much to be hoped that, in these days, when new enterprises are being floated in India almost every day, capitalists will turn their attention to this industry before long. One solution would be for Government to take a proportion of the

output of any factory established on sound lines at an agreed price.

As to other lines of district work, the large number of estates inspected in order that advice might be given in regard to such matters as proper drainage, the growing of manure crops, and remedial measures against insect pests furnishes gratifying evidence of the increasing confidence shown by landholders in the Department. We are sorry to see that the practice of transplanting paddy, in preference to sowing it broadcast, makes very slow progress in Mysore, the area transplanted being still counted in tens of acres instead of, as it should be, in hundreds. Green manuring, on the other hand, is spreading rapidly, especially in the Eastern Division where the Department was not able to meet the demand for sannhemp and daincha seed. In last year's Report, promise was held out of a revival of the cultivation of Indigo in Mysore but this so far has come to nothing. The reason apparently is that too long a time has elapsed since it was last grown in the State and that the methods of extracting the dye have been forgotten. Mr. Krishnayya, the Officiating Director, considers the cultivation of indigo worth reviving both on account of its intrinsic value and also on account of its use as a rotation with ground-nut. He has, however, no concrete suggestions to offer beyond recommending that, if it is revived, it should be grown on a fairly large scale and that the manufacture should be demonstrated on one of the Government farms. The Government point out that the question particularly affects the dyeing industry in the State as there is bound to be a considerable deficiency in the supply of dye-stuffs for some years to come. They, therefore, direct that the attempts to revive the industry should be followed up until some practical conclusions can be reached.

The suggestion in the Government review that each section of the report should be

prefaced by a brief account of the outstanding results achieved during the year applies with special force to the work of the scientific branches. In the case of the entomological section, for example, the reader is told that a large poster illustrating the stages of *Kumbihula* (*amsacta albistriga*) and the methods of handpicking, which was the first of its kind to be issued in India, was distributed during the year but he is not told what crops this pest attacks. He is also told that a remedy for the pulse-beetle has been devised and that it is of such an extremely simple nature that it is within the reach of the poorest ryots. He might have been informed what it is instead of being referred to a bulletin which is in the press. The valuable work done on the entomological side during the year, including as it did great progress in dealing with coffee-borer and sugar-cane borer, is obscured by the method in which the results are presented. On the mycological side, the spraying of arecanut trees with Bordeaux mixture, seems to bid fair entirely to stamp out the *Koleroga* disease.

We should have been glad to know more about the courses at the Hebbal and Chikkannanahalli agricultural schools. It is clear, however, that the education given at Chikkannanahalli is eminently practical. The students themselves did all the work necessary for the making of such agricultural implements as wooden ploughs, and mhoite fixtures whilst rings, chains, sickles, pincers and cultivator blades were turned out in the blacksmith's shop. The school is doing valuable work as a centre for spreading knowledge of improved agriculture and as an out-agency of the Agricultural Department. It maintains a branch implement depot, raises seeds of improved varieties on its farm for distribution to the local ryots, demonstrates improved methods and lends out improved implements, whilst its Head-master is frequently consulted by the local cultivators. The experiment in imparting

agricultural education in elementary schools which was referred to in the review of last year's Report has not been extended. In fact, in one school, that at Varthur, it has been discontinued owing to lack of a sufficient number of students and of suitable land for practical instruction. A modified scheme has been submitted for the approval of Government but no details of it are given.

An interesting estimate of the monetary value of the work done by the Department during the year is given in the Report. The total is put down at Rs. 1,75,000 of which far the largest item is the increased revenue to sugar-cane growers due to the 720 tons of oil cake sold by the Department. This is estimated at Rs. 1,05,000. The improved methods of cultivation resulting from the use of the implements sold by the Department are calculated to yield about Rs. 50,000. Rs. 6,000 are put down to the introduction of a better yielding variety of sugar-cane and Rs. 3,000 to that of improved strains of ragi. The increased income to the cultivator resulting from the adoption of such practices as green manuring, single seedling transplantation of paddy, and the distribution of cotton, ground-nut, turmeric, etc., is estimated at Rs. 7,000. The Government consider this satisfactory so far as it goes but add that it is by no means commensurate with the amount of energy and money expended nor is it proportionate to the increase of 40 per cent in the total production in the next ten years forecasted by the Director of Agriculture in a note submitted to the Economic Conference. For our own part, we think that the Agricultural Department has been too modest in its estimate of its achievements and that many of the items in the account, such as the increased values due to the distribution of improved strains of ragi or of ground-nut and cotton seed have been pitched too low. Nothing has been allowed for the preventive work done by the mycological and entomological sections though the indirect results of this in

increasing yields or rather in preventing their diminution must be considerable. None the less, it is distinctly disappointing that so much of the monetary value of the work done by the Agricultural Department should be attributable to the use of manure and of improved implements and so little to the introduction of improved strains when it is remembered what has been accomplished in other parts of India by the introduction of Pusa No. 12 wheat or of Punjab 4 F. or *Karunganni* cotton. The estimate of the money value of the work accomplished by the Department would have been more enlightening if the total expenditure on the Department had also been given. This is an omission which should certainly be rectified in future Reports.

One small point must be noticed in conclusion. The Report on the work of the botanical section states that, among the American cottons, New Orleans gave the best results and that this has been confirmed by the Bombay Agricultural Department. This statement is not borne out by the recently published Reports of the latter Department. These show that it is doing its best to eliminate New Orleans from the mixture, known as Dharwar American and is concentrating its attention on the other constituent of the mixture, Upland Georgian. There is evidently a misunderstanding somewhere and we would suggest further communication on the point with the Bombay Agricultural Department.

IMPROVEMENT OF COFFEE IN
MYSORE.

BY D. W. MEPPAN,

District Economic Superintendent, Kadur.

COFFEE was introduced into Mysore about 300 years ago the seed supposed to have been brought by Bababooden who settled on the Chandra Drona Range gave the hills his name and sowed the seed brought from Mecca. Some of the plants are said to be still existing at the shrine. From the seed of these plants all the original coffee in Mysore is said to have been obtained and from Mysore taken into Coorg and was said to have been first planted at the Nalknad palace.

Up to about 1873—74, all the coffee planted came from this stock and planters began to notice that their crops were falling off, the stems of their old trees lichen covered, gnarled, wornout and unresponsive, poor spindling wood following the pruning, small clusters of berries and poor and irregular crops resulting, and *Leaf disease*. Planters began to look for more vigorous types of coffee. About 1873—74, the exact year is not known, a Cricket Team visited Coorg and two of the members, Messrs. Jupp and Stephenson were so struck with the vigour of the Coorg coffee plants that they got seed from Coorg. This seed was probably from the same stock as that of Mysore, but cultivation in the open and more liberal treatment had produced a hardier, more symmetrical and prolific plant.

The first Coorg seed most likely came from the late Mr. J. P. Hunt's "Glenmore" and was planted at "Aigoor" and "Chandrapore." The plants raised from Glenmore seed were a beautiful shape—the primaries growing for $2\frac{1}{2}$ to 3 feet at right angles to the stem and then drooping in a graceful curve, the matured secondaries drooping

and giving light for the new wood. It was a really beautiful compact healthy plant with a fine spread and a very heavy cropper. The imported plant began to be known as the "Coorg" and the indigenous variety as "Chik" short for Chikmagalur—the centre of the coffee market.

The "Chik" was very different in shape and growth to the Coorg.

The primaries of the "Chik" grew upwards and the first pair of secondaries always started at the tips of the primaries. Whereas with the Coorg the secondaries always start from the first pair of nodes nearest the stem.

The "Chik" was not an annual Cropper—every alternate or third year it gave a knock-out crop and then rested. The bean was larger, fuller, better shaped, better coloured, better flavoured and more thickly coated often engrained with the silver skin. It fetched £. 10 to 20 a ton more in the London Market than Coorg coffee. When Coorgs were first introduced they were used for supplying vacancies. It was very soon noticed that in field of old Mysore or Chik coffee reeking with leaf disease, the young Coorgs stood out prominently with every leaf on the plant, dark green, almost black, in colour, without a spec of disease.

In this connection it is interesting to quote extracts from what Mr. Browne of Kurki-Kunda a planter of over forty years experience says in his Bulletin on the "Coffee Industry in Mysore."

"The industry appears to have been in a flourishing condition until the sixties, when the old Mysore coffee, known more commonly as "Chik" coffee showed signs of being played out. Leaf disease appeared and accelerated its end. By the early seventies "Chick" plants would not grow and the industry seemed to be on its last legs—nothing but the introduction of a new variety of Coffee to take the place of the "Chik" could save it. Fortunately such a plant was found in Coorg, and from the

date of its introduction into Mysore, took place the renaissance of the coffee industry in the Province. It was found that this plant was to a great extent immune from leaf disease; plants put out as supplies in fields of old "Chik" which were ravaged by leaf disease were but slightly affected. The result was a boom in coffee, wornout Estates were replanted and new Estates opened

* * * *

and the out put of coffee per acre increased largely."

With the exception of some of the older more conservative Planters, who said the Coorg produced an inferior bean and Mysore would lose its good name, most of the younger men pulled out their old "Chiks" and replanted the land with "Coorgs." In this replanting it was found that many of the unresponsive old "Chicks" had hardly any feeding roots, the stems were bored and all the pores clogged so that the sap was not able to circulate. The plant was absolutely wornout suffering from senile decay and the only remedy was to replace it by a better cultivated, a healthier, more robust, more disease resisting plant and to do away with the effete old "Chik."

There are very few European Estates where any Chiks exist at the present day, where there are any, they are being steadily removed every year.

Since the introduction of the Coorg forty-five years ago, we find history repeating itself, what happened to the Chik has happened to the Coorg. The plant has become wornout. Planters find vacancies dont come on, new clearings are not so successful—plants lose their primaries, wood dies back the plant is susceptible to every kind of disease and becomes so enfeebled that regular crops are a thing of the past. In this connection Mr. Brown says:

"I have already pointed out that when the Coorg supplanted the old Mysore "Chik" it was to a great extent immune from the disease—It now suffers from it severely not

so badly as the old Mysore tree at its worst, but sufficiently so to make it apparent that the time has come to look about *for another and more robust plant to take its place* more especially to replant estates which are declining from old age."

For the last fifteen or twenty years the Planters have been again looking for a stronger, healthier, more disease resisting, better cropping plant. Liberia, Jamaica, Costa Rica, Guatamala, Marogogipe, Golden drop, Robasta and various Hy-brids have been tried. Liberian would only do at low altitudes,—required a year to ripen and the coffee required special machines to pulp and mill it. Jamaica, Costa Rica, Guatamala—all get leaf and other diseases just as bad as "Chiks" or "Coorgs." Marogogipe declined to crop "Golden drop" a sport from Brazil is a hardy prolific plant but not free from disease. Robusta is a shy bearer at over 3,000 feet and requires twelve months to ripe its crop.

Several Hy-brids have been introduced and tried and so far as Mysore is concerned none of them have been what one may call an unqualified success.

All those that have been produced seem to be crosses between Liberian and Coorgs and more or less accidentally discovered. Those grown in Manjarabad and sold from Rs. 10 to 20 a seer, do not seem to have come up to the anticipation and hopes of the buyers. About 40 per cent of the crop is "Jelloo", of the other 60 per cent a large percentage of the plants are like the Liberian, with large thick glossy leaves, straggling in shape producing coffee of various sizes and shapes and a good deal of "Jelloo." Some plants are absolute mules and do not crop at all and a very few perhaps 5 per cent look like "Coorgs" with a long narrow leaf and coffee berries of an uniform size—but the plants are uncertain croppers.

The Chendrapore Hy-brids over which Mr. Hamilton spent a good deal of time and

trouble do not seem to have panned out as well as was expected. There seems to be an uncertainty about the plants coming true to strain and although they are said to be the sixth or seventh generation, the cropping powers do not seem to have become fixed.

Mr. Jackson of Coorg is said to have produced a very superior Hy-brid said to be about the 12th or 15th generation, that comes true to type a fine robust, spreading—heavy cropping tree. The Coorg Government, to encourage him, have very generously given him a large block of virgin forest at Malambi and Mr. Jackson has twenty-five to thirty acres planted.

The following resolutions were passed at a Conference of Coffee Planters in Bangalore at which the Director of Agriculture in Mysore was present in June, 1915.

- (i) "That better results can be obtained by selection and breeding methods with existing types of coffee than by importing seed of Arabia or other varieties from other countries."
- (ii) "That selection methods on a systematic scale are absolutely necessary. The question of raising a robust disease resisting coffee plant is a matter that Government should take up at once. There is no doubt that the Coorgs like the old "Chik" is played out and unless a new and superior plant is introduced, the steady decrease in produce of coffee that has been going on for some years will become a serious matter and affect the economic and material progress of the Kadur District which is so dependent on coffee. Years ago Parry & Co distributed coffee seed free to ryots to encourage them to grow coffee.

Government should similarly buy the best available seed and distribute it to Planters,

especially the Indians, who are always backward in adopting new methods and trying new plants.

There is no doubt that of all the varieties of coffee introduced into Mysore for the last fifty years—be they Coorgs, Liberians, Jamaica, Santhos, Guatamala, Moragegipe, Golden drop, Robusta or the various Hy-brids—none can compare with the plant raised by Mr. L. P. Kent of "Doddengooda" from his "selected" seed. The plant is not a Hy-brid—but of old Mysore type with a remarkably strong constitution, and the plants raised from the seed come absolutely true to type and do not, like every hy-brid that has been produced, throw back to dozens of different types of plants many absolutely sterile and useless and nearly all producing a large percentage of empty beans—"Jelloo."

This selected seed is a medium sized, plump coffee, reported on well in the London Market and classed by an eminent coffee expert of long experience, Mr. Holland, as typical of the old Mysore bean of forty or fifty years ago, eighty-five or eight-six bushels going to a ton of clean coffee. As many as 24,000 plants have been raised and planted out from half a bushel of this seed.

The young plants in a forced nursery—sown in February have five to six pairs of leaves uniform in size and appearance and when planted out in the field in good, bad, or indifferent land, as vacancies or new clearings, under old coffee, in dense shade or in the open, grow to plants of ten pairs of primaries in the year, and carrying every leaf down to the coteledons.

Two year old plants have primaries of $4\frac{1}{2}$ feet long and are bearing crop at the rate of two to three Cwt. an acre which they mature, and show no sign of leaf disease or any of the primaries dying back.

A field of three years old plants, topped at $3\frac{1}{2}$ feet have every pair of primaries down to the ground, the spread is ten to twelve feet, the stems thick and strong and the

primaries remarkably thick and carry a crop of 5-6 Cwts. an acre and crowded with wood for the coming year.

The growth is as good as what a field of first class Coorgs used to be, forty years ago. Most young Coorg charings with three or four Cwts. of coffee lose nearly all their leaves where the cluster of berries are—whereas these plants retain all their leaves from the stem to the end of the branch twelve to thirteen clusters on a secondary are common and twenty-five and thirty berries in a cluster.

The ten year old original trees have a spread of over 12 feet across and several were carrying a crop of about half a bushel a tree apparently without any effort.

A small field of ten acres of four years old plants bearing 6-7 Cwts. an acre a most marvellous sight, no matter what the shade tree, (even under tamarinds), what the soil, or aspect the plants are a uniform sheet and unless seen, one would hardly credit it being possible to grow such coffee in the time.

No manure has been applied until the last month or so and they have not received any treatment other than what is given to any other ordinary young clearing.

This type seems practically immune from leaf disease.

The introduction of this coffee is the beginning of a new and a very promising era in the History of the coffee Industry in Mysore. Mr. Kent is receiving orders for his seed from Africa, Java, Ceylon, Coorg, the Nilgiris and almost every coffee growing district in the world, and several Mysore Planters are planting this seed largely. Mr. Kent guarantees 100 per cent germination absolutely true to type.

It is a pity the previous history of these plants is not known.

All the information that Mr. Kent can give is, that he found a few very strong

healthy plants in one of his clearings, and bred from them by netting the trees at blossom time.

Great credit is due to Mr. Kent for discovering and propagating this very fine type of coffee and in a few years, there will be many hundreds of acres of it distributed all over the coffee districts.

As is stated above it does not appear to be a Hy-brid, as it has none of the characteristics of all the Hy-brids grown in Coorg, Mysore, Java or Brazil. The plants from Mr. Kent's plants come absolutely true to type, bear extraordinarily and mature all they set, with no empty or "Jelloo" fruit and without the trees losing leaf dying back or suffering in any way.

The plant appears to be possessed of a very fine vigorous constitution with a very strong root growth and probably a much stronger root acid than the ordinary coffee plant, thereby being able to absorb a larger quantity of the available plant-food in the soil, material that is practically looked up, so far as the other known varieties of coffee are concerned.

The Forest Products Laboratories at Madison, developed from "clabber" (casein) taken from fine Wisconsin Jerseys a glue of remarkable adhesiveness. Wood blocks joined with it have held against ten days' soaking supplemented by twenty-four hours' boiling in water. The process is now available without cost of industry and enable any manufacturer of furniture to put together articles that will stand the test of any climate.

NOTE ON TOBACCO.*

THERE are two principal species of tobacco in India, viz., *Nicotiana tabacum* and *Nicotiana rustica*. The former is the common tobacco of India, being grown all over the country. It is apparently the only species cultivated in the Peninsula and forms the most important source of the tobacco of commerce. The latter, viz., the yellow-flowered tobacco (*Nicotiana rustica*) is widely cultivated in Bengal, Assam, the Punjab, and also in Kashmir. In some districts of the Punjab and also in Purnea (Bihar) it is said to be supplanting the cultivated forms of *Nicotiana tabacum*, while it is the prevailing species in the damper soils of the southern portion of the tobacco-growing district of Rangpur (Eastern Bengal). This species is smaller than *Nicotiana tabacum*, but hardier. It requires shorter time to come to maturity, but it is said to give a higher yield than *Nicotiana tabacum*. The most noticeable difference between the leaves of the two species is that the leaves of *Nicotiana rustica* are stalked.

The cultivation of tobacco is very widespread in Burma. The two main varieties are called "Burmese tobacco" and "Havana tobacco." Of the Burmese tobacco there are two main varieties "Seywet-gyi," the large-leaved variety and "Seywel-gyun," a smaller-leaved variety with pointed leaves. The former yields a heavier crop, but the latter gives better quality. There is always a great demand on the market for both the

Havana and the Burma tobacco. The smooth leaves of the Havana plant are used for the wrappers and the coarser Burmese leaf for the filling.

AREA UNDER CULTIVATION.

The most important tobacco tracts in British India are:—(i) the Coimbatore and Dindigal tract of Madras, where the *Usi-Kappal* and *Wara Kappal* varieties are largely grown, the former supplying the Trichinopoly cigar; (ii) the Godavari Delta of Madras; (iii) the Rangpur tract of Bengal; (iv) the Bihar Districts of Bihar and Orissa; (v) Guzerat in Bombay and (vi) the delta tract of Burma.

The season for harvesting varies in different localities ranging from December to June, but the bulk of the crop is harvested during the months of February, March and April. The leaves when quite dry, are assorted and placed in heaps in stacks to ferment. They are then tied into bundles of 25 or 30, a useless leaf being employed for tying each bundle. The leaves are laid perfectly flat, the bundles being fan-shaped. In this condition they are baled, the broom-like ends projecting outwards. By varying the degree of fermentation of the leaves, different qualities of tobacco are obtained. A black variety is used in India for cake tobacco, and this is the most common product, but a certain amount of yellow leaf is grown for cigar making.

The statement below gives the acreage under tobacco in each province in British India during the past five years:—

* With acknowledgements to the *Indian Trade Journal*.

Acreage under tobacco in each province in British India.*

Province				Years				
				1913-14	1914-15	1915-16	1916-17	1917-18
Bengal	...	...	...	319,400	322,700	319,800	301,540	292,100
Madras	...	...	...	207,819	227,182	216,416	207,741	207,579
Bombay	Presidency	...	...	89,491	88,467	91,513	95,077	102,423
	Sind...	...	...	8,404	9,945	10,990	7,926	7,898
United Provinces	Agra	...	...	60,797	85,159	68,648	83,722	66,885
	Oudh	...	...	14,611	17,621	16,102	15,047	18,299
Bihar and Orissa	...	...	...	115,800	105,500	118,400	118,100	118,700
Punjab	...	...	...	47,425	63,887	55,832	67,621	62,017
Burma	Upper	...	...	34,003	32,539	25,320	27,573	27,078
	Lower	...	...	61,293	56,522	53,823	56,699	62,115
Central Provinces	...	...	...	12,061	15,935	17,642	16,514	18,455
Berar	...	...	...	14,146	13,318	14,414	10,891	12,469
Assam	...	...	...	8,431	9,512	8,514	9,677	9,539
North-West Frontier Province	...	...	...	5,421	7,314	8,566	11,687	8,230
Ajmer Merwara	...	...	...	2	25	24	37	60
Delhi	...	...	...	662	712	1,015	1,084	1,001
Coorg	...	...	...	34	11	19	7	14
Manpur Pargana	...	...	...	...	...	...	...	...
Total				1,001,710	1,056,349	1,027,038	1,030,943	1,014,862

*The acreage under tobacco in the Indian States for which returns are available was 51, 163 in 1916-17. Several important States furnish no returns. But as a safe estimate the total acreage in the Indian States may be put at 100,000.

YIELD.

The yield of tobacco varies in different localities ranging ordinarily from 160 lbs. to 800 lbs. per acre, the return under high cultivation being from 600 lbs. to even 3,200 lbs. per acre. Mr. N. G. Mukerji in his *Handbook of Indian Agriculture* (1907) says:—"A well-grown crop is expected to yield from 20 to 24 maunds of cured leaves per acre, the money value of which may be estimated at Rs. 100 to Rs. 120, Rs. 5 being the average price per maund of country cured tobacco." Taking the average yield

per acre at Rs. 75 only (=say £5) the total annual value exceeds 5½ millions sterling.

EXPORTS.

The bulk of the tobacco produced in India is consumed locally. Nevertheless there is also a large and increasing export trade. The tables on the next page show the exports of tobacco (leaf and manufacture thereof) from British India during the pre-war year 1913-14 and the subsequent years and also the average value of the produce exported:—

Exports of tobacco (manufactured and unmanufactured) from British India during
1913-14 to 1918-19.

Articles	Quantity					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
1	2	3	4	5	6	7
Tobacco—	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Unmanufactured ...	27,817,318	16,490,045	24,250,324	27,742,308	20,243,963	31,505,995
Manufactured—						
Cigars ...	1,825,635	1,733,959	1,557,735	1,135,481	1,004,364	870,644
Cigarettes ...	19,059	38,164	55,796	309,913	301,774	169,817
Other sorts ...	361,314	419,357	481,178	424,765	314,059	436,592
Total Tobacco ...	30,023,326	18,681,525	26,345,033	29,612,467	21,864,160	32,983,048

Articles	Value					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
	8	9	10	11	12	13
Tobacco—	£	£	£	£	£	£
Unmanufactured ...	211,811	144,654	201,238	252,992	237,210	549,182
Manufactured—						
Cigars ...	102,435	92,686	83,628	67,265	67,527	63,388
Cigarettes ...	1,034	2,793	3,377	25,637	28,008	15,830
Other sorts ...	4,286	5,223	5,147	7,261	7,316	13,989
Total Tobacco ...	319,566	245,356	293,390	353,155	340,061	642,389

Average Value of Exports of Tobacco during 1913-14 to 1918-19.

Articles	Average value per cwt.					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
Tobacco—	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Unmanufactured ...	0 17 1	0 19 8	0 18 7	1 0 5	1 6 3	1 19 1
Manufactured—						
Cigars ...	6 5 8	5 19 9	6 0 3	6 12 8	7 10 7	8 3 1
Cigarettes ...	6 1 6	8 3 11	6 15 7	9 5 4	10 7 11	10 8 10
Other sorts ...	1 6 7	1 7 11	1 4 0	1 18 3	2 12 2	3 11 9

It will be seen that notwithstanding higher rates of freight, scarcity of tonnage and other factors connected with the war, the exports of tobacco have maintained and even exceeded their pre-war level while there is an appreciable rise in values of the produce exported.

EFFECTS OF WAR ON EXPORTS.

Tobacco Leaf.

The bulk of the Indian tobacco exported consists of leaf, the kinds chiefly shipped being the "Bispath" (cheap country tobacco) and "Poolah" varieties of the Rangpore kind. "Bispath" has no market in the United Kingdom, but is largely used by the Dutch.

The varieties of tobacco leaf exported from the Calcutta Market are:—

From the Rangpur and Cooch Behar Districts—(a) "Selected Bispath," (b) "Ordinary Bispath," (c) "Motihar"—of the size of betel leaves, used mainly for chewing purposes, and (d) "Poolah"—Leaves large-sized and used for cigars.

From the Tirhoot District.—(a) "Moorun," a chewing tobacco—in two grades "Chutkee Moorun" and "Burkee Moorun," (b) "Kethpherry"—hookha tobacco, (c) "Doojee"—also hookha tobacco.

From the Purnea District.—"Mootihar"—hookha tobacco.

From the Orissa District.—"Gach," with stick and leaves, for country cigars.

From Burma.—(a) "Thindoor," (b) "Sindine." These are large leaf tobaccos used for cigar covers and cigars. (c) "Kooah"—a strong flavoured tobacco used for cigars.

From the Guntur District, Madras Presidency.—"Golden leaf" and "Jhootee" used in cigarette manufacture.

The statement on the next page illustrates the effect of the war on the export of Indian tobacco leaf and its destination and value:—

Exports of tobacco leaf from British India during the years 1913-14 to 1918-19.

Articles, and countries of Final Destination ; also share of each Province.	Quantity						Value					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
Tobacco—												
Unmanufactured—	lbs	lbs	lbs	lbs	lbs	lbs	£	£	£	£	£	£
United Kingdom	397,968	1,017,358	5,479,145	5,421,715	179,246	2,919,104	4,474	6,220	28,584	47,871	2,094	40,056
Cyprus	...	...	...	...	64,316	164,288	...	...	...	...	1,152	3,449
Aden and Dedpendencies.	9,789,105	6,416,069	5,204,346	5,824,871	4,273,317	6,410,863	79,608	65,553	63,780	69,985	68,816	104,459
Bahrain Islands	7,402	10,871	44,955	43,645	15,820	52,357	123	140	592	812	191	940
Maldives	13,328	23,696	25,760	24,883	17,005	15,288	239	464	371	525	297	281
Ceylon	180,803	107,618	110,529	90,216	78,973	79,784	3,021	2,012	1,930	1,520	1,270	1,375
Straits Settlements (includ- ing Labuan.)	2,200,871	1,984,509	1,840,552	1,938,089	2,494,724	3,043,319	24,395	25,223	22,712	24,325	30,899	53,891
Federated Malay States	435,704	451,500	534,251	902,267	1,011,583	1,163,189	5,502	5,943	6,597	11,270	12,860	20,652
Honkong	7,125,370	3,099,887	1,698,338	1,569,280	1,569,280	1,627,616	50,241	20,888	12,393	11,818	11,842	19,450
Egypt (a)	...	...	72,431	99,454	2,833,609	364,960	...	...	817	1,442	33,723	8,365
Mauritius and Dependencies	6,971	15,188	8,820	12,250	4,150	14,142	218	423	280	510	149	409
Other British Possessions.	5,918	2,658	1,609	7,938	199	3,009	68	38	22	103	6	37
Total British Empire	20,163,440	13,129,354	15,020,736	16,024,213	12,542,222	15,857,919	167,889	126,904	138,078	170,181	163,299	253,364
Germany	1,288,375	266,434	...	...	...	...	7,019	1,106	...	...	...	...
Holland	2,196,050	1,127,545	1,095	5,719,846	...	...	9,161	4,056	8	39,322	...	...
Belgium	353,860	37,380	...	...	...	...	2,406	140	...	...	...	...
France	3,576,923	1,667,050	7,539,204	5,092,708	5,915,003	13,085,489	22,829	9,583	43,975	32,817	51,592	261,833

Turkey, Asiatic—Red sea.	...	...	...	...	3,528	686	...	...	...	...	110	20	...
Persian Gulf	...	56,311	975,110	442,591	1,555,001	1,636,767	...	...	448	12,846	5,872	18,632	24,067
Maskat Territory and Tru- cial Oman.	38,594	33,499	24,274	42,314	10,107	36,795	331	371	228	424	159	426	...
Other Native States in Arabia	20,038	17,715	134,313	129,073	150,609	89,502	348	271	2,060	2,132	2,666	1,512	...
Persia	38,176	50,584	55,171	...	21,466	64,110	787	694	573	...	255	858	...
China (exclusive of Hong- kong and Macao)	...	17,618	42,000	...	...	240	...	178	275	...	...	8	...
Egypt (b)	35,456	2,254	...	...	...	...	287	18	...	...	...	...	...
Tunis	...	...	21,600	...	...	...	...	...	128	...	...	...	...
Morocco	71,175	...	358,920	288,000	...	614,160	468	...	2,127	2,133	...	5,004	...
Italian East Africa (Somali- land and Eritrea)	35,211	83,107	75,703	...	47,803	...	286	869	920	...	576	...	...
Japan	...	...	...	...	10	108,010	...	...	...	...	...	1,900	...
Somaliland (French)	...	...	...	...	...	11,680	...	...	...	...	...	183	...
Other Foreign countries	20	1,194	2,198	35	1,056	1,323	*	16	20	1	11	27	...
Total Foreign Countries	7,653,878	3,360,691	9,229,588	11,718,095	7,701,741	15,648,076	43,922	17,750	63,160	82,811	73,911	295,818	...
Share of Bengal	...	2,530,383	6,303,638	15,201,272	3,151,356	4,825,657	20,621	13,599	32,949	111,316	39,327	182,257	...
„ Bombay	...	6,541,701	6,343,050	6,242,424	5,572,698	7,472,332	80,722	67,073	79,284	76,861	86,789	120,444	...
„ Sind	...	88,733	245,106	262,820	694,082	906,385	374	966	2,563	2,841	8,275	14,797	...
„ Madras	...	2,362,763	2,269,552	3,489,397	2,987,372	3,749,071	29,281	31,001	28,520	40,740	39,060	69,714	...
„ Burma	...	4,966,465	9,088,978	2,596,395	7,838,455	14,552,550	30,818	32,015	57,922	21,234	63,759	161,970	...
Total	27,817,318	16,490,045	24,250,324	27,742,308	20,243,963	31,505,995	211,811	144,654	201,238	252,992	237,210	549,182	...

(a) Included in "Foreign Countries" prior to 1915.16.

(b) Included in "British Possessions" from 1915.16.

* Value Rs. 5 = 6 s. 8 d.

As will be seen from the figures the chief pre-war destinations of tobacco leaf in order of importance were (1) Aden and Dependencies, (2) Hongkong, (3) France, (4) Straits Settlements, (5) Holland and (6) Germany. During the war period a considerable quantity is shown as exported to the United Kingdom. The bulk of the shipments were on account of Dutch consignees who took delivery in England and accepted the risk of being permitted to re-export to Holland.

CIGARS.

The cigar factories in India are centred in Madras and Burma. In the case of Madras "cheroots" there is no special grading of

quality, as each exporting house has its own blends. Indian cigars weigh more than Cubans or Manillas.

The chief pre-war destination of Indian cigars was the Straits Settlements to which 1,438,613 lbs. were sent out of a total of 1,825,635 lbs. exported during 1913-14. The Straits Settlements still continue to be India's chief customer taking 722,959 lbs. out of 870,644 lbs. exported in 1918-19. The effect of war was to divert a portion of the exports to the Persian Gulf which absorbed 21,980 lbs. in 1918-19 against *nil* in 1913-14. The statement below gives the export figures for the last six years:—

Exports of Cigars from British India during 1913-14 to 1918-19.

Articles, and Countries of Final Destination: also share of each Province.	Quantity					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
1	2	3	4	5	6	7
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Tobacco—						
Manufactured—						
Cigars—						
United Kingdom ...	86,033	60,289	71,846	76,155	39,015	49,417
Gibraltar ...	13,950	5,450	...	3,955	1,646	...
Aden and Dependencies.	7,830	5,525	7,560	2,126	722	1,429
Ceylon ...	5,990	3,086	7,224	10,526	1,142	6,785
Straights Settlements (in- cluding Labuan) ...	1,438,613	1,421,454	1,324,777	921,559	854,276	722,959
Federated Malay States.	163,428	188,688	80,848	52,972	33,014	20,713
Egypt (a) ...	...	...	8,263	9,073	14,171	11,517
Natal ...	713	503	56	434	200	44
Mauritius and Dependen- cies ...	4,899	3,350	4,419	3,946	4,742	2,956
Zanzibar and Pemba ...	...	100	249	260	1,208	790
East African Protectorate.	5,122	3,112	13,922	15,979	4,012	4,274
Bermudas ...	10,025	5,685	6,575	6,850	2,000	...
Western Australia ...	177	21	16	72	75	...
South Australia (includ- ing Northern Territory.)	399	125	248	108	...	175
Victoria ...	426	117	185	30	...	133
Tasmania ...	662	402	379	...	283	...
New South Wales ...	3,286	372	185	478	1,061	562
Queensland ...	50	209	41	143	...	...
Australian Commonwealth (Total) ...	5,000	1,246	1,054	831	1,419	870
New Zealand ...	4,561	4,758	3,704	1,908	799	808
Other British Possessions.	2,672	2,518	4,294	1,458	1,212	336
Total British Empire ...	1,748,836	1,705,764	1,534,791	1,108,032	959,578	822,898

[(a) Included in "Foreign Countries" prior to 1915-16.

Exports of Cigars from British India during 1913-14 to 1918-19.—*contd.*

Articles, and Countries of Final Destination : also share of each Province	Value					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
	8	9	10	11	12	13
Tobacco—	£	£	£	£	£	£
Manufactured—						
Cigars—						
United Kingdom ...	8,325	5,270	6,880	7,376	3,381	4,461
Gibraltar ...	739	253	...	266	80	...
Aden and Dependencies.	626	414	597	216	49	108
Ceylon ...	542	308	473	789	88	908
Straits Settlements (including Labuan) ...	79,399	76,409	68,093	50,564	54,626	49,599
Federated Malay States.	5,269	5,858	2,473	1,786	1,231	850
Egypt (a) ...	...	...	924	1,040	2,146	1,733
Natal ...	166	94	1	102	41	3
Mauritius and Dependencies ...	341	223	302	263	299	206
Zanzibar and Pemba ...	...	5	14	29	111	73
East African Protectorate.	362	221	1,091	1,332	301	463
Bermudas ...	501	346	541	523	181	...
Western Australia ...	34	6	2	10	5	...
South Australia (including Northern Territory) ...	38	12	21	22	...	13
Victoria ...	57	8	20	2	...	34
Tasmania ...	48	33	28	...	32	...
New South Wales ...	373	38	22	78	138	72
Queensland ...	6	25	5	33	...	...
Australian Commonwealth (Total) ...	556	122	98	145	175	119
New Zealand ...	781	937	520	399	194	125
Other British Possessions.	230	195	256	142	88	28
Total British Empire ...	97,837	90,664	82,263	64,972	62,991	58,676

(a) Included in "Foreign Countries" prior to 1915-16.

Exports of Cigars from British India during 1913-14 to 1918-19—*continued*.

Articles and Countries of Final Destination; also share of each Province	Quantity					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
	1	2	3	4	5	6
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
<i>Tobacco—continued</i>						
<i>Manufactured—continued</i>						
<i>Cigars—continued</i>						
Denmark	1,262	915	...	...	...	...
Germany	9,506	619	...	...	...	...
France ... ..	...	2,272	...	1,449	...	...
Spain	3,554	4,622	556	...	...	...
Turkey, European (in cluding Grete or Candia)	30,663	4,825	...	...	...	...
Turkey, Asiatic—						
Levant and Black Sea	8,135	1,460	...	...	...	...
Persian Gulf ...	...	1,698	4,445	17,528	29,839	21,980
Persia	90	213	150	822	180	1,077
Siam	14,584	5,322	15,662	6,025	11,701	18,424
China (exclusive of Hong- kong and Macao) ...	619	1,592	1,104	255	667	490
Egypt (b)	4,890	4,397	...	...	...	...
Sumatra	15	...	...	75	108	3,012
Java	207	40	10	136	15	1,756
Other Foreign Countries.	3,274	220	1,017	1,159	2,276	1,007
Total Foreign Countries.	76,799	28,195	22,944	27,449	44,786	47,746
Share of Bengal ...	11,497	4,065	6,047	3,933	880	435
„ Bombay ...	4,570	5,943	15,123	35,862	51,000	39,976
„ Sind ...	185	25	278	1,909	2,340	4,504
„ Madras ...	988,668	887,165	748,908	466,346	247,274	162,584
„ Burma ...	820,715	836,761	787,379	627,431	702,870	663,145
Total ...	1,825,635	1,733,959	1,557,735	1,135,481	1,004,364	870,644

(b) Included in "British Possessions" from 1915-16.

Exports of Cigars from British India during 1913-14 to 1918-19—*contd.*

Articles and Countries of Final Destination : also share of each Province	Value					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
	7	8	9	10	11	12
	£	£	£	£	£	£
Tobacco—						
Manufactured—						
Cigars—						
Denmark	130	100	...	...	...	...
Germany	516	47	...	...	...	...
France ... ..	...	271	...	107	...	...
Spain	166	225	67	...	...	...
Turkey, European (in- cluding Crete or Candia)	1,890	315	...	...	...	...
Turkey, Asiatic ...						
Levant and Black Sea ...	527	67	...	...	...	...
Persian Gulf ... ..	...	86	441	1,631	3,659	2,461
Persia	9	24	23	139	7	180
Siam	510	261	696	271	697	1,225
China (exclusive of Hong- kong and Macao) ...	51	170	65	20	46	33
Egypt (b)	497	447	...	...	...	...
Sumatra	1	...	...	5	5	507
Java	15	3	1	32	2	253
Other Foreign Countries.	286	6	72	88	120	53
Total Foreign Countries.	4,598	2,022	1,365	2,293	4,536	4,712
Share of Bengal ...	1,034	413	512	323	97	24
„ Bombay	371	467	1,327	3,125	6,207	4,827
„ Sind	30	4	18	200	212	398
„ Madras	39,399	31,762	28,358	20,703	9,097	8,600
„ Burma	61,601	60,040	53,413	42,914	51,914	49,539
Total ...	102,435	92,686	83,628	67,265	67,527	63,388

(b) Included in "British Possessions" from 1915-16.

CIGARETTES.

During recent years there has been a conspicuous increase in the number of cigarette factories in India. The cigarettes turned out are mostly for local consumption, but there is also an important export trade.

Prior to the war, Zanzibar and Pemba and German East Africa were the chief customers of Indian cigarettes. The effect of the

war was to divert the bulk of the exports to the Persian Gulf which absorbed 138,390 lbs. out of 169,817 lbs. exported from India in 1918-19 against *nil* in 1913-14. Persia, Bahrein Islands and Zanzibar and Pemba are the other chief customers of India at present, in order of importance. The statement on page 6 gives the export figures for the last six years :—

Exports of Cigarettes from British India during the years 1913-14 to 1918-19.

Articles and Countries of Final Destination : also share of each Province.	Quantity					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
1	2	3	4	5	6	7
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Tobacco— Manufactured— Cigarettes— United Kingdom	10	33	2,120	...	...	...
Aden and Dependencies ...	184	...	740	86	1,801	284
Bahrein Islands	601	879	1,158	9,150	6,522	6,950
Ceylon	1,483	1,227	501	532	165	157
Straits Settlements (including Labuan)	121	2,727	1,017	285	54	580
Zanzibar and Pemba	8,666	7,505	7,564	6,733	2,371	5,668
East African Protectorate ...	968	166	1,781	14,717	3,644	4,033
Other British Possessions ...	...	...	407	...	343	35
Total British Empire ...	12,033	12,537	15,288	31,503	14,900	17,707
Turkey. Asiatic—						
Red Sea ... ..	...	...	...	400	...	...
Persian Gulf ... ..	...	20,507	39,254	269,929	261,993	138,390
Maskat Territory and Trucial Oman.	1,322	1,701	483	1,689	362	3,303
Other Native States in Arabia ...	45	...	...	1,378	2,726	325
Persia	2,137	2,255	616	4,994	19,372	9,714
German East Africa	2,846	730	...	...	403	336
Other Foreign Countries ...	676	434	155	20	18	42
Total Foreign Countries ...	7,026	25,627	40,508	278,410	280,874	152,110
Share of Bengal	832	2,890	3,163	10,018	...	40
„ Bombay	13,943	16,733	51,123	203,856	187,870	91,499
„ Sind	3,983	17,682	1,450	96,027	113,874	78,121
„ Madras	196	800	30	...	...	157
„ Burma	105	59	30	12	30	...
Total ...	19,059	38,164	55,796	309,913	301,774	199,817

Exports of Cigarettes from British India during the year 1913-14 to 1918-19.

Articles, and Countries of Final Destination : also share of each Province	Value					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
	8	9	10	11	12	13
Tobacco—						
Manufactured—						
Cigarettes—	£	£	£	£	£	£
United Kingdom ...	1	5	117	...	...	...
Aden and Dependencies ...	4	...	23	7	156	47
Bahrein Islands ...	30	59	71	664	568	538
Ceylon ...	116	88	61	261	19	21
Straits Settlements (including Labuan) ...	17	180	45	30	7	49
Zanzibar and Pemba ...	470	540	551	459	248	641
East African Protectorate ...	47	13	59	367	200	214
Other British Possessions ...	...	...	26	...	26	27
Total British Empire ...	685	885	953	1,788	1,284	1,537
Turkey, Asiatic—						
Red Sea ...	...	...	...	33	...	...
Persian Gulf ...	...	1,598	2,349	23,170	25,018	12,351
Mascat Territory and Trucial Oman ...	55	122	10	114	43	305
Other Native States in Arabia ...	1	...	...	57	170	60
Persia ...	95	124	36	474	1,448	1,515
German East Africa ...	163	40	...	...	44	50
Other Foreign Countries ...	35	24	29	1	1	12
Total Foreign Countries ...	349	1,908	2,424	23,849	26,724	14,293
Share of Bengal ...	46	183	183	193	...	2
„ Bombay ...	790	1,314	3,074	16,982	20,257	9,697
„ Sind ...	172	1,241	114	8,461	7,748	6,029
„ Madras ...	11	46	1	...	...	42
„ Burma ...	15	9	5	1	3	...
Total ...	1,034	2,793	3,377	25,637	28,008	15,830

OTHER MANUFACTURES.

With regard to manufactures of tobacco (other than cigars and cigarettes) Maldives and Straits Settlements were India's chief pre-war customers. Both still retain their places, but a considerable portion of the

exports is now sent to the Persian Gulf and Siam while the pre-war exports to these destinations were practically *nil*. Exports to Ceylon also show a considerable increase. The statement on the next page gives the exports figures for the last six years:—

Exports of tobacco—manufactured—other sorts—from British during 1913-14 to 1918-19.

Articles, and Countries of Final Destination: also share of each Province	Quantity					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
1	2	3	4	5	6	7
Tobacco— Manufactured—	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Other stores— United kingdom ... ..	...	210	70,336	39,375	...	...
Aden and Dependencies	18,558	5,457	8,925	4,652	41,143	2,880
Bahrein Islands	24,890	329	5,068	14,029	6,132	16,572
Maldives	134,064	20,416	234,584	168,075	104,034	86,360
Ceylon	26,083	22,104	43,596	50,791	63,585	47,073
Straits Settlements (including Labuan)	88,847	129,017	64,998	35,844	42,354	121,049
Hongkong	15,885	16,834	9,955	1,883	1,320	574
East African Protectorate	1,138	...	411	294	...	1,670
Fiji Islands	55	140	295	2,627	...	...
Other British Possessions	2,967	1,824	974	287	1,751	776
Total British Empire	412,487	382,331	439,142	318,157	260,319	276,954
Turkey, Asiatic—						
Red Sea ... ..	...	...	477	11,616	1,092	14,473
Persian Gulf	489	2,424	24,368	52,174	12,452	53,929
Maskat Territory and Trucial Oman	29,550	32,528	8,681	26,431	21,849	21,399
Other Native States in Arabia	16,623	...	5,019	7,581	...	15
Java	943	985	1,676	6,990	6,124	11,820
Siam ... ..	...	...	205	168	10,900	52,380
Japan ... ..	...	...	...	...	...	5,128
Other Foreign Countries	1,222	1,089	1,710	1,648	1,333	594
Total Foreign Countries	48,827	37,026	42,036	106,608	53,740	159,638
Share of Bengal	335,730	357,999	419,891	283,027	167,264	150,707
„ Bombay	1,835	2,811	30,097	78,647	61,877	62,209
„ Sind	6,402	8,535	7,910	15,073	21,622	24,359
„ Madras	9,167	8,085	15,927	47,868	60,676	43,515
„ Burma	8,180	41,927	7,353	150	2,620	155,802
Total	361,314	419,357	481,178	424,765	315,059	436,592

Articles and Countries of Final Destination ; also share of each Province	Value					
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19
	8	9	10	11	12	13
Tobacco—						
Manufactured—	£	£	£	£	£	£
Other stores—						
United Kingdom ...	...	8	441	202	...	...
Aden and Dependencies ...	151	39	57	32	667	47
Bahrein Islands ...	456	11	68	179	161	163
Maldives ...	813	1,265	1,394	1,010	850	729
Ceylon ...	218	420	854	1,815	2,738	2,645
Straits Settlements (including Labuan) ...	1,614	2,455	1,304	557	608	3,822
Hongkong ...	116	111	69	12	10	5
East African Protectorate ...	22	...	2	4	...	108
Fiji islands ...	2	12	23	169	...	...
Other British Possessions ...	105	58	34	13	33	34
Total British Empire ...	3,497	4,379	4,246	3,993	5,067	7,553
Turkey, Asiatic—						
Red Sea ...	...	...	7	226	30	692
Persian Gulf ...	21	115	394	1,883	612	2,727
Maskat Territory and Trucial Oman.	568	64	296	800	1,037	653
Other Native States in Arabia ...	157	...	120	127	...	1
Java ...	25	40	29	187	164	490
Siam ...	...	...	3	2	359	1,685
Japan ...	...	...	...	...	...	160
Other Foreign Countries ...	18	46	52	43	47	28
Total Foreign Countries ...	789	844	901	3,268	2,249	6,436
Share of Bengal ...	3,399	3,070	3,317	2,264	1,844	1,854
„ Bombay ...	35	128	516	2,386	1,630	2,726
„ Sind ...	270	370	337	620	920	1,465
„ Madras ...	324	343	738	1,988	2,837	2,713
„ Barma ...	258	1,312	239	3	85	5,231
Total ...	4,286	5,223	5,147	7,261	7,316	13,989

FUTURE PROSPECTS.

Repeated efforts have been made in India for many years to improve the quality of the produce; these efforts have met with some success and the quality has improved. The Agricultural Research Institute at Pusa has been and is conducting elaborate research work with a view to further improving the quality of the Indian tobacco. A pure line selection, which is suitable both for cigarette purposes and also for general cultivation, continues to increase in popularity among tobacco growers. Definite schemes of seed distribution have now developed in North Bihar, in Burma and in the Central Circle of the United Provinces. In Bombay, as a result of attempts to introduce exotics, a superior hybrid variety has been produced which ousted the local variety. The distribution of Havana seen by the Agricultural Department has led to the establishment of a superior variety of tobacco in Lower Burma and in Arakan. Steps have also been taken in the direction of introducing new varieties of tobacco plants into other parts of India.

The one-sixth preference accorded by the United Kingdom Tariff to Empire-grown tobacco and manufactures thereof, which works out at slightly more than 1s. per lb. of unmanufactured tobacco and at about 2s. 6d. per lb. of cigars, should serve as a stimulus to the already expanding Indian export trade, since a large quantity of tobacco (both leaf and manufactures) is annually exported to the United Kingdom, the exports in 1918-19 amounting to 2,968,521 lbs. valued at £44,517.

With the conclusion of peace and the prospects of return to normal conditions of freight and shipping the prospects of the trade seem to be bright.

CO-OPERATION IN MADRAS,
1917-18.

BY "VIATOR."

MR. Hemingway's Report on the working of his Department in Madras during 1917-18 is refreshing reading after some of the Reports recently commented on in these columns. As the Local Government say in their review, it is a record of continued progress in all directions. The extent of this progress can best be illustrated by a few statistics. The number of societies increased by nearly 23 per cent, their membership by 17.1 per cent and their working capital by 14.6 per cent. The reserve funds showed an increase of about 23 per cent and the net profits one of 67.6 per cent. The total deposits attracted by the societies amounted to 95½ lakhs of rupees against 85½ lakhs in the previous year.

Even more important, in our opinion, as a gauge of true progress is the state of the collections. The co-operative movement cannot be regarded as being in a thoroughly sound state if arrears are allowed to pile up. We will not inflict any more figures on our readers especially as the numerous tabular statements which Mr. Hemingway gives are not at all easy to follow. It is sufficient for present purposes to note that there was an all round improvement in the collection both of principal and interest in the case of central banks and agricultural societies and some falling off in that of non-agricultural societies. Whilst this is distinctly satisfactory as compared with the rapidly increasing arrears in some other Provinces, Mr. Hemingway admits that the arrears due to agricultural societies are far larger than they should be. He points out, however, that the figures are hardly a fair index to the condition of the average society as they are unduly swelled by the few really bad societies.

In Ganjam, for instance, one society contributed 25 per cent of the arrears to the district total. In the Southern districts of the Madura Section, there are a number of old societies which got into a thoroughly bad state some years ago whilst in the Kistna District, the societies near the Kolair lake have been persistently unfortunate. *Prima facie*, there would seem no justification for allowing these bad societies to continue to exist.

Another test of the soundness of agricultural societies is the proportion of their loans which is granted for productive purposes. This is steadily increasing in Madras and, in 1917-18, amounted to 68 per cent, 30 per cent being granted for redemption of prior debts and the insignificant remainder of 2 per cent for non-productive purposes. Mr. Hemingway considers that long term loans are too readily given, especially in the Tamil country, and mentions cases in which loans have been given as a matter of course for ten years. He rightly points out that this is demoralising to the borrower and tends to restrict the credit both of the society and of the member, thus preventing the financing of ordinary agricultural operations.

It is possible that, in the future, agricultural societies for purposes other than credit will play an even greater part in the development of Indian agriculture than the credit societies but at present, their promise considerably exceeds their performance. Societies for joint purchase are making considerable progress in Madras as regards numbers but the total amount of their transactions is still very small. The dealings of the seventeen societies whose activities are entirely confined to joint purchase amounted to Rs. 8,145 only whilst those of credit societies and local unions which added this to their ordinary business amounted to almost half as much again. The articles purchased were chiefly agricultural implements, seed and manure but the credit societies also purchased some household

requirements. The method followed by these societies was for the panchayet to secure indents from the members of the amount of the articles required and then to make a joint purchase to the best of their abilities. The articles were paid for at once either in cash or out of a loan given for the purpose by the society. Joint purchase was not confined to agricultural societies. Four Municipal Employés Societies made purchases of food for their scavenger members periodically. The food was distributed on the spot, the cost being deducted from the wages of the employés at the end of the month. Two municipal societies also made joint purchases of cloth. Co-operative societies are beginning to buy salt direct from Government depôts.

The co-operative sale of agricultural produce in Madras has made much less progress than co-operative purchase. Paddy and chillies were sold in a few cases to the benefit of the members of the societies which did so. Madras has yet to follow the lead of Bombay in establishing cotton sale societies. The activities of the seed Unions in the Tinnevely tract are not mentioned, presumably because they are not registered co-operative societies. These Unions which consist of five or six ryots undertake to sow the whole of their cotton area with selected seed supplied by the Agricultural Department, to gin the cotton and sell the lint jointly under the supervision of the Department and to keep the seed for sale in the following season. The spirit of the Unions is, therefore, truly co-operative even though they are not formally enrolled.

Madras possesses one co-operative manufactory. The Nidamangalam society in the Tanjore District makes bone meal manure and bone phosphate which it sells to its members far below the market rate. The total value of the manure was only Rs. 685 but it is satisfactory that even this small beginning should have been made.

As in other Provinces, notably Bengal, the Madras Co-operative Department is making special efforts to help the weavers, who have been very badly hit of late by the rise in the price of yarn which has been much greater than that in the price of the finished product. The most interesting of the new weavers' societies started during the year was that at Berhampur where the rise in the price of yarn had thrown so many men out of work that there had been considerable emigration to Calcutta. Of the share capital of Rs. 3,000, Rs. 1,500 was subscribed by the Sub-Collector, Mr. R. W. Davies and the District Judge, Mr. B. C. Smith. The difficulties of the society were, however, only beginning when the necessary capital was raised. It was found impossible to get cheap yarn and improvement in the condition of the weavers could, therefore, only be brought about by better marketing arrangements for their cloth. Fortunately, Sir Gordon Fraser of Messrs. Best and Co. came to the rescue and that firm agreed to supply yarn at cost price and to sell the cloth at a small commission, undertaking all risk of loss. Whilst the generosity and public spirit of the three gentlemen mentioned deserves the highest praise, we feel constrained to point out that this is philanthropy not co-operation. We cannot but think that, if weavers' societies are to be established on a really sound basis and if there is to be the development of similar activities in other parts of the country to which Mr. Hemingway looks forward, there must be less dependence on charity and more on the working out of a business arrangement. If weavers' societies cannot subsist without as large a measure of philanthropic assistance as has been received by the Berhampur Society, it is well that the fact should be frankly recognized, regrettable as it would be, and efforts made to find some other solution of the problem presented by decaying cottage industries. The old Conjeeveram Urban Weavers' Union worked at a profit of Rs. 1,000, apparently without

extraneous aid and we hope that it will not be long before the Berhampur Society is able to do likewise. In Bengal, the weavers' societies are grouped together in a Union at head-quarters. Each society purchases shares in the Union with its own share capital but takes no financial responsibility beyond this. The Union arranges to purchase yarn at wholesale rates and to dispose of cloth which the societies are unable to sell. Some such arrangement should be feasible in Madras. The object of co-operation, after all, is to enable weavers and others to stand on their own feet.

As to other forms of non-agricultural co-operation, most of the building societies, now ten in number, did good work. One interesting society is the Sadananda Printing Society in South Canara which undertakes the printing work for all the primary societies in the South Canara District and supplies them with account books and forms. It worked at a small loss which should be easily converted into a profit, if all the societies in the district join it as they should do. The Madras Co-operative Department has always paid special attention to work amongst the backward classes and there are now 160 societies of which over one-third of the members are Panchamas, the membership of 43 of them being confined exclusively to that class. Amongst these societies are several for municipal employés and it is pleasant to read that many of them are admirably managed and that the Chairman and superior officers of the municipalities concerned take a real interest in them. The co-operative work which is being done by the Secretaries of the Young Men's Christian Association among Christians and Panchamas and by the Fisheries Department amongst the fishermen of the West Coast deserves special mention. It is also worthy of notice that the backward agency tracts in the Northern Circars are being opened up by the Co-operative Department and that the remarkable straightforwardness and honesty of their

unsophisticated inhabitants renders them a specially promising field for the operations of the Department as it has, unfortunately, in the past for exploitation by unscrupulous dealers and sowcars.

The Report is not quite so clear as it might be on the important question of supervision. It states that, at the end of the year, there were only 209 primary societies which were not enjoying Union supervision of some sort or other. It would appear that this supervision is still exercised, in many cases, by Central Banks who are, however, gradually divesting themselves of it and handing it over to local Unions of which eighteen new ones were registered during the year. Mr. Hemingway writes very hopefully of the local Union both as a means of supervision and as a form of co-operative education. He considers the work of a really good local Union of the most encouraging pictures that he has seen of the rural life of the Presidency.

Other satisfactory features of the year's working were the great fall in the number of suits filed, due to the fact that the arbitration rule was freely used, and the closer co-operation between the Co-operative and Agricultural Departments. The two Departments now hold an annual conference and are drawing up a joint programme of development work. This is a most encouraging sign of the times. Both Departments are fortunate in possessing enthusiastic Directors and the combination of their forces makes the outlook in Madras especially hopeful.

SOME ASPECTS OF TANGADI REVENUE, 1919-21.

BY N. SAMPATHIENGAR.

TANGADI bark, which is the most important vegetable tanning material, is growing more and more in importance as a commercial produce and this fact has manifested itself in the increasing revenue to Government under this head year by year. The figures reached during the recent auction sales are said to be record ones, and it is the purpose of this note to see whether we have reached the topmost level or whether we are still to attain it.

In the year 1914-15, the price of the bark was Rs. 25 to Rs. 30 per *baram* of 680 lbs. This gradually rose to Rs. 35, and the prevailing rate in the first quarter of 1916-17 was Rs. 40. Since then the competition of the skin tanners, who, dealing in an article of luxury, could look for profits ranging from 200 to 400 per cent and, therefore, afford to pay for the bark upto Rs. 100 per *baram*, was so keen that the rate for the bark rose to Rs. 82—8—0 in the beginning of the second quarter of 1917-18. Just then the Government of India required from the tanneries in South India 8,000 bales of 60 tanned hides each per month, while the normal outturn was only 2,000 bales. This was a serious question and the matter was, therefore, considered deeply from all its aspects. The first solution arrived at was the prohibition of skin tanning to induce every tanner to take up to hide tanning. Since the Government was the purchaser of the entire stock of the tanned hides, it was in their interest to see that the prices were kept down as low as possible. This they could not do as long as the high prices for the bark prevailed. The Government control over the bark trade was thus necessitated prohibiting all private dealings in the stuff and directing that the entire quantity of bark collected by the contractors should be sold to Government at the prices fixed by them.

In co-operation with the Imperial Government, the Government of His Highness the Maharaja of Mysore brought the bark trade in Mysore under their control. The previous years' auction sales had brought in a high revenue to Government and it was, therefore, considered that, if large remissions were not made to the contractors, they would sustain heavy losses on account of the low rates fixed by Government. It was with this object that the Government of His Highness the Maharaja of Mysore ordered heavy remissions to be made by which, it is understood, the Government have sacrificed a revenue of about Rs. 5,06,000. From statement No. II, it will be seen that, in spite of the fall in the quantity of bark supplied during the period of control by 50 per cent and in the value by 59 per cent, the contractors have still made a profit of about Rs. 1,26,000. If the supply of the bark had been upto the normal quantity, the contractors would have made a further profit of Rs. 3,74,000 and their total profit would have thus worked out to Rs. 5,00,000 and made the remissions unnecessary. Since the contract areas were confirmed on the previous years' contractors who had the best of the advantages of the very high prices for the bark before the control, it was not expected of them to make any profit in the concern, and the concession granted to them to consign their bark to the Government Depôts "Carriage Forward" was quite sufficient to induce them to work out the areas satisfactorily. Further the confirmation of the areas in the name of the previous years' contractors was the greatest concession shown to them, as otherwise they would not have been able to recover the heavy advances they had made to their *shikmies*.

It has been thought by many that the bids in the recent auction sales were made by contractors who made no calculations at all as to the future of the market. This might have been so in the case of one

or two taluks, but the fact of a universal increase should necessarily dispel this idea. The contractors have rightly thought that, when the restrictions on the bark trade are removed and the markets are rendered free, the high pre-war rates would prevail and help them to make profits.

In statement No. I an endeavour is made to show that there is every scope for Government to realise still Rs. 3,40,000 more revenue under the existing conditions alone. The pre-control rates, as stated above, were upto Rs. 82-8, and were showing a tendency to rise when the restrictions were imposed upon skin tanning. And now for the purposes of the present calculation, an average rate of Rs. 65 per *baram* is taken, leaving a fair margin for all market fluctuations. Ample provision is made for collection and other charges including unforeseen losses due to irrecoverable advances. Profit to the contractors is not ignored and a provision for a profit of 20 per cent is made and this seems to be more than reasonable.

With the help of the *Review of the Foreign Rail-borne Trade of the Mysore State* for the year 1917-18, published by the Department of Industries and Commerce, the annexed statement No. I is prepared. From this statement it is worked out that our forests, under the existing conditions alone, are capable of yielding 90,400 *barams* of bark during the contract period of two years. This statement is certainly open to revision as only an approximate figure has been adopted to represent the export by road to the adjoining British territories. Further not less than half the produce of the Monakalmuru taluk is received in Bangalore by rail from stations situated outside the State. This quantity is recorded in the Trade Statistics as the import into the State and has been deducted now from the export to find out the net export. In the absence of any correct information as to the quantity of bark that this taluk yields, it is not possible to rectify this defect.

While the improvements for increasing the output of bark in the State are being effected, it is in no less degree important that the progress made in this direction should be closely watched. This can be done satisfactorily by preparing and recording correct statistics of yield of each area in a systematic manner year after year.

At the outset it may be said that the Trade Statistics published by the Department of Industries and Commerce would serve the purposes of the Forest Department. But it is open to question whether statements prepared for the purposes of general trade statistics would amply serve for calculating the yield of revenue to Government. It should also be remembered that it is not possible from this record to go into minute details for finding out the yield capacity of each contract area. Moreover, these statements, as stated in para 6, include under the imports even the local produce to some extent. It is, therefore, necessary for the Forest Department to have its independent statistics prepared year after year and base its calculations of revenue on this. Just now the new contract period has commenced and the Forest Department should lose no time in beginning its work in this important direction.

In this report no special account of *Kakke* Bark is taken, as there is absolutely no independent information available regarding the same. Moreover, the attention paid towards the collection of this produce has been little and as long as *tangadi* bark commands a high market rate, no contractor will care to trouble himself with.

The next thing to discuss is whether the quantity of bark extracted represents the maximum yield capacity and whether it is consistent with the permanent supply. A careful review of statement No. I will disclose the fact that the produce extracted in any year is not really the yield capacity of our forests and that the extract of bark is

entirely dependent on the market rate procurable for the same. In the year 1913-14, the yield is shown to be 28,559 *barams* which has gone upto 53,585 *barams* in 1916-17, which is an increase by 88 per cent. When no improvements are effected on the growing side, the only rational explanation is that the extraction is dependent upon the market rate for the stuff. If it was not for the fall in the rate for the bark from the middle of the second quarter of 1917-18, from Rs. 82-8 to Rs. 55, on account of the prohibition of the skin tanning, the collection work would have been carried on with continued activity and the total yield for that year would not have worked out to be less than that of 1916-17. It is, therefore, certain that our forests are capable of yielding more bark than the quantity that has been worked out in statement No. I.

In finding out the yield capacity of our forests, one important item has all along been ignored, and that is the extent to which the quantity of bark collected in the private holdings contribute to make up the worked out quantity. In the absence of any definite information on the point, it is useless to take any cognizance of it at all.

In the terms of the agreement executed by the contractors certain conditions are laid down regarding the maintenance and submission of accounts relating to the collection and removal of bark by the contractors on one side and constant inspection of such accounts by a competent authority of the Forest Department on the other. If these conditions are strictly enforced, several of the problems enumerated above can be solved easily.

To maintain, year after year, the revenue under the bark at an almost constant figure, it is very necessary to prevent inroads on the standing immature growths by the contractors. The cutting of immature plants not only leads to deterioration in the quality of the bark but also jeopardizes the future. It is,

therefore, essential to arrange for frequent inspections of the stocks of barks with the contractors.

The quarrels between the Government contractors and the contractors of private holdings are also growing in volume. These quarrels are the greatest impediments in the way of the speedy collection of the bark, especially by Government contractors. By experience gained during the time of the control, it is learnt that such quarrels are mainly due to false estimates of the yield made by inexperienced persons who, in some way or other, are known to be interested in the applicants, and on whose recommendations licenses are blindly issued. This is a subject in itself and requires a very careful handling as it involves the question of private rights.

The local officers of the Forest Department themselves will, in future, issue passes

to the contractors under the Transit Rules and it is now open to question whether it is desirable to allow counter-checking also to form part of their duty and whether it will not be better to have it done directly by the Central Office.

This note is prepared with a view to elucidating the existing defects which arise mainly from not recording the information connected with bark exploitation in the State in the form in which it is required to be done. It is hoped that the Forest Department will in future take special care with regard to such a commercially important produce as tanning bark, and will arrange for regular statistics of yield, etc., to be prepared year after year so that the revenue under the bark may not be allowed to go down.

Statement No. I.

Bark Account				1913-14	1914-15	1915-16	1916-17	1917-18
Export in Ry. Mds.	...	...	...	168,000	142,994	187,740	252,864	187,347
Import do	...	...	...	42,300	30,272	33,744	24,377	37,858
Net export do	...	...	...	125,700	112,722	153,996	228,487	149,489
do in lbs.	...	...	...	10,307,400	9,243,204	12,627,672	18,735,934	12,258,098
<i>Tanned Hides Account :—</i>								
Export in Ry. Mds.	...	...	...	45,000	67,601	81,835	87,418	80,647
or								
No. of hides exported	...	...	...	405,000	608,409	736,515	786,762	725,823
Bark consumed in tanning the above				9,112,500	13,689,202	16,571,588	17,702,145	16,331,018
in pounds	...	...	...		
Add net export in pounds	...	...	...	10,307,400	9,243,204	12,627,672	18,735,934	12,258,098
Approximate yield in lbs.	...	...	...	19,419,900	22,932,406	29,199,260	36,438,079	28,589,116
or								
In barams of 680 lbs.	...	...	...	28,559	33,724	42,940	53,585	42,043

Average yield per year is 27,315,572 lbs. or	...	...	...	40,170 barams.
Add approximate quantity exported by road	...	...	...	5,030 ..
Total yield per year				45,200 ..

or

Yield for two years, which is the contract period, is ... 90,400 barams

Value that can be realised at on average rate of Rs. 65 per baram Rs. ... 58,76,000

Deduct:—(1) Cost of collection and interest on capital at Rs. 25 per baram and loss due to irrecoverable advance at Rs. 5

=at Rs. 30 per baram

Rs. 27,12,000)

(2) Government dues

,, 19,00,000)

46,12,000

Net gain to the contractor

...

...

...

Rs. 12,64,000

or 27 per cent on the capital outlay

Since ample provision is made for collection charges, interest on capital and loss due to irrecoverable advances a profit of about 20 per cent is more than reasonable.

The excess profit which will be about Rs, 3,40,000, which should go to increase the Govt. Revenue.

State No. II.

Supply of bark during the period of Control :—

(1) For local tanneries	...	...	...	25,345 candies of 500 lbs. each.
(2) .. export	...	...	...	6,848 ..

Total ... 32,190

Deduct import from outside the State ... 1,880

Local Produce ... 30,310 candies or 22,287 barams

Value realised by the contractors at Rs. 34 per candy Rs. 10,30,540

Deduct:—(1) Cost of collection, etc., at Rs. 30 per baram or

Rs. 22 per candy

... Rs. 6,69,820)

(2) Government dues

... Rs. 2,38,000)

Rs, 9,04,820

Net gain to the contractor

...

...

...

Rs. 1,25,720

or nearly 14 per cent

ECONOMICS IN THE WEST.

The British Industry.

London, 21st August, 1919.—Economically and industrially we are still in the doldrums. With a government expenditure which exceeds four million pounds a day it could hardly be otherwise. The country's enterprise is paralysed by this dead weight of outgoings for which there is no adequate return. The direct effects of such extravagant expenditure are obvious. Money is made dear for the manufacturer by the government demands upon the money market, trade is disorganized by the fact that the government on the one hand competes for labour and pays extravagant prices for it, and on the other expends lavishly in the distribution of doles to unemployed who with government money in their pocket are under no necessity to work. But the indirect consequence of the existing financial recklessness are even more serious. Prominent amongst them is to be reckoned the industrial unrest which disturbs the country. The working classes simply cannot realise that there is the most urgent need for all to work at high pressure and reduce the appalling load of debt while money is being squandered right and left on objects many of which are transparently futile. Government extravagance, too, has its share in producing the high prices of the necessities of life which are only a grave source of discontent. In fact, we are in a completely vicious circle and there must remain until a drastic check has been applied to the tendency of almost all government departments to spend money on a war scale.

Happily there are signs that a new era is being entered upon. The government at last have awakened to the danger which threatens the country and incidentally menaces their own existence in the reckless financial methods which are being

pursued. We are promised by the Premier a thoroughgoing overhaul of the entire official system and the presentation of revised estimates more in accordance with the nation's capacity than those recently presented to Parliament. Whether even Mr. Lloyd George with all his dynamic energy will be able to exorcise the fiend of extravagance which has so long dominated our public departments is, however, a question upon which there is some doubt. He has to reckon with private interests which are strongly entrenched in the government and his own policy is one which does not lend itself to economy. However, we may hope for the best now that public opinion is thoroughly aroused and people of all classes are alive to the gravity of the issue which retrenchment presents. Meanwhile, it is satisfactory to note that the industrial ferment has conspicuously died down. The stand made by the London police against the revolutionary movement which sought to use them for Bolshevist ends has had a splendid moral effect throughout the country. The defect of the Yorkshire miners has contributed to the restoration of healthy conditions. The nation is manifestly rich of social strife and is turning surely to the patriotic position that the State's needs are paramount and must be pursued irrespective of the interested clamour of any section however powerful it may be. In this connection may be mentioned the significant action of a powerful body of northern engineers who a few days ago met at Manchester and decided to postpone all demands for increases of pay in view of the urgent necessity of increasing the production of manufactures to restore the national credit.

There can be no doubt that the better elements amongst the working classes are at last awake to the peril of the industrial situation arising out of the excessive cost of production. Foreign competition, and especially American competition is very keen in lines which were once markedly British.

Prices are being quoted even in the home market for goods against which the British manufacturer cannot compete. Especially severe is the fight in the steel and tin plate trade. There was a case the other day in which a question was given for steel rails by an American firm which was £ 2 per ton below that of the lowest English tender. If this happens in the green tree what will be the position in the dry? It at the moment when the full effect of the coal trouble has not been realised the transatlantic manufacturer can undersell to this extent in the United Kingdom what may he not do later on when the inevitable results of mining syndicalism are reaped? Well, indeed, may the thoughtful workman pause before he lends any further support to the subversive policy of the extremists. He is not unfamiliar with the old adage about the goose and the golden eggs. He has no desire to emulate the Russian Bolshevik and strangle industry for an idea. He wants to live and desires that his country shall not lose its reputation as the great home of successful manufacturing industry. Hence we find a wholesome revolution in working class circles in favour of the adoption of methods leading to increased production and the general stability of industry.

It has not been overlooked here that one of the favouring factors for the recovery of British industry is the rise in the sterling exchange value of the rupee. Obviously with an increase of sixpence in the conventional figure a great incentive is offered to the purchase of British goods by India. The amount will act as a sort of bounty and stimulate all classes of exports and notably those which are in most popular demand such as cotton piecegoods. But of course the influence of high exchange must not be exaggerated. There has been a tremendous increase in the cost of production on this side and the rise in the value of the rupee will be an inadequate set off to it. We have, moreover, to bear in mind the

unsettling effect that a fluctuating exchange has on trade. Traders are chary of buying when they do not know from one day to another what the standard of value actually is. Probably in the long run it will be found that the consequences to infant Indian industries are not so serious as the Bengal Chamber of Commerce has anticipated. At all events where India has consolidated her industrial position as in the steel trade she has little to apprehend from the effects of dear silver. The demands of the world are so enormous and the upward trend of wages in Europe and America is so marked and persistent that she should be able to more than hold her own in spite of exchange.

A UNIVERSAL LANGUAGE.

In the evidence given before the Committee now sitting here on the subject of Indian Government I noted the other day a declaration in favour of an all India language other than English. The witness appeared to favour Hindustanee, though from the only report of his evidence that I was able to obtain it was not made very clear that he had any strong preference for that form of speech. How far his views may be supported in India I have no means of knowing, but it seems to me that it would be a fatal step at this stage of India's development to depose English from the position it at present occupies as the recognised medium of general speech throughout the Indian continent. At the present time English is spoken by upwards of 200 million people. It is the one language which will take a trader with the greatest facility round the world. Fifty years hence with the growth of America and the English speaking colonies its position will be still more predominant. In fact, if there is ever to be a universal language of Commerce it must be English. What would be the position of India if she cut herself off from the linguistic source to which all the other great trading races of the world were open?

Hindustanee would not help her even if she could plant it in the parts of India where it is almost as much an exotic as English. Outside her own borders it would have less value commercially than Esperanto. I say nothing of the effect that the dethronement of English would have on education, especially technical training. The point I wish to emphasise is that if India is ever to be a great industrial nation she simply cannot do without the English language.

FLAX CULTIVATION.

Flax cultivation as an Imperial industry is exhaustively discussed in the report of the Empire Flax Growing Committee which was appointed some little time since. Having pointed out the undesirability of an industry so important as the linen industry is having to rely upon external sources of supply the Committee describe the efforts made by the government under the necessity of abnormal war conditions to foster the revival of flax growing in the United Kingdom and to extend its cultivation within the Empire. At present the cultivation in England and Scotland is of an experimental character and owing to the high cost of labour the doubt is expressed whether it will ever be a real economic success. Ireland is in a different position and it is hoped that there may be a large extension of cultivation in that country. But the most promising new fields are outside the United Kingdom. In Western Canada flax growing has been introduced with a certain measure of success and results already achieved in British East Africa warrant the hope that the development will be maintained and extended. Nothing is said about India, but it is almost certain that in some part of the vast area under British rule flax cultivation might be successfully carried on. The labour difficulty which presents so formidable a bar to the production of flax in Great Britain and to an almost equal degree in the Dominions would not here present itself and there would,

it might be imagined, be other advantages. The subject is certainly worth investigation in view of the growing importance of the linen industry and the increasing value of its raw material.

DEVELOPMENT OF RADIO ACTIVITY.

The increasing costliness and scarcity of coal is causing attention to be devoted to the development of alternative sources of power. One of the most instructive contributions to recent literature on this subject is the series of articles which Sir Oliver Lodge is contributing to the *Observer*. Though the concluding contribution has yet to appear it is made plain that the writer entertains strong hopes that in the near future scientific discoveries will be made which will reduce coal to an entirely subordinate position in the industrial world. His chief reliance appears to be placed on the development of radio activity. The precise character of this agent is explained by Sir Oliver Lodge in a few illuminating sentences. "In radioactive substances" he writes, "there is a store of atomic energy and some of the energy is liberated by the emission of flying particles which are flung off from time to time whenever the atom is degenerating or passing from a more complex to a more simple form. And this emission of energy is very great. When it was first observed that a few grains of radium were continuously giving off a great deal of energy and yet not disappearing some scientific men, even Lord Kelvin himself, spoke of it as a marvel or as a sort of miracle. The stuff burned as it were and yet was not consumed. It soon became clear, however, that there was no flaw in the law of conservation of energy. The stuff certainly possessed and certainly loses all the energy it emits but it loses very little weight. The amount of energy it gives off per grain is so prodigious that the loss of weight is imperceptible. "The question is whether this locked up energy of the atom can be utilised. If it can a new era will have dawned upon the world by the side of which the electric age and even the steam age will seem trivial.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

"Dry" Extracts and Perfumes.

Washington, D. C., U. S. A., July 22nd, 1919.—The usefulness of extracts and perfumes for other than their advertised purposes has long been known, but with the advent of new legislation it has been a problem for the chemist to find a way out for the manufacturer. Extracts made in the usual way and then evaporated to dryness after the addition of sugar so that a spoonful of the powder equals a spoonful of the usual fluid, have not found favor with the housewife. Emulsions have been advocated, but these almost without exception separate in a short time. There would seem, however, to be a promising field in this direction for research on the part of some physical chemist.

Where an oil is involved, such as lemon, bakers have found dilution with highly refined vegetable oils satisfactory, and get an excellent distribution of the flavor in their product. Vanilla has caused the most concern, chiefly because the standard tests involve those for resins which only alcohol extracts from the bean. The presence of such resins has been taken as an indication of vanilla from the bean in contrast to synthetic vanillin. Percolations with glycerine or its derivatives give excellent extracts under controlled conditions, but tests for resins cannot be obtained. Obviously, we shall have to change our tests to conform to present conditions.

In work of this type the chemist is rather limited in his choice of solvents, for they should have food value, be absorbed by the alimentary tract, and known to have no ill effect upon the human system. Many solvents which suggest themselves are at once ruled out by these specifications.

In perfumes the restrictions are not so great, solvents with strong odors being those

found most unsuited. Organic research continues to give us new solvents, and if we come to the worst we can use undiluted perfumes in small drops in place of the alcohol solution in an atomizer.

FARMING WITHOUT THE AID OF LABORERS.

How large a farm can one able-bodied man, unassisted, plow, cultivate, plant and harvest with a fair degree of efficiency?

Not so very long ago it would have been considered extremely presumptuous for any unaided man to undertake the cultivation of a farm of more than a few acres. Now, however, thanks to the formidable array of labor-saving machines, invented and placed on the market in recent years, it is by no means beyond the range of possibility for an enterprising worker to cultivate from thirty to one hundred acres, according to the kinds of crops he expects to raise.

The power-driven cultivator is one of the recent additions to the labor-saving agricultural machines that have completely revolutionized farming in the United States. The machine may be used as a cultivator, and for drilling, planting and sowing, special attachments quickly adapting it for the particular work that is to be done by it.

This machine is equipped with six rollers for breaking up the clods of earth after plowing. By adding one or more rollers the capacity of the machine may be materially increased. It can also be used for planting three or more rows at a time. With a different attachment the machine can be used for sowing oats or grass, and by still another attachment it can be adapted for drilling the ground or row-planting.

The drive wheels of this versatile agricultural machine are also its steering wheels. The power is supplied by a gasoline engine, and one man can easily run it.

The construction of the machine is simple and substantial. To make the changes for adapting it to the different kinds of work which it is able to perform takes but little

time and does not require the services of an expert machinist.

With a machine of this kind in his possession the farmer is truly independent of the labor market.

WHAT NEXT IN AERIAL NAVIGATION?

The Atlantic has now been spanned by a lighter-than-air craft as well as by airplane, and a new era has been entered so far as aviation is concerned. It is significant that the British, in commenting on their great achievement, made it clear that the R-34 was almost obsolete to-day as a first-class dirigible, and that larger dirigibles were rapidly nearing completion. They pointed out that a reasonable increase in the dimensions of the dirigible increased its lifting power and speed enormously, so that in the very near future we could look forward to dirigibles measuring 1,000 feet and more in length and carrying over 200 tons of cargo.

As for the landing problem of huge dirigibles—and this is being made much of as an argument against them—it is but a matter of being properly prepared. Our arrangements to receive the R-34 at Roosevelt Field, it is evident, were hurriedly improvised. This was understood. The United States army and navy did not have sufficient notice to prepare suitable housing facilities; but now that long-distance travel by dirigible seems to be so close at hand we can rest assured that suitable and sufficient mooring and housing facilities will soon be provided at various points along the Atlantic and Pacific coasts. And in this connection it may be that suitable mooring towers may prove quite suitable for mooring dirigibles out in the open, making huge sheds necessary only for building and repairing the aerial greyhounds.

In any event, the dirigible has proved its long-distance flight qualities in a big and successful way. Trans-Atlantic flight service is rapidly approaching realization, although much remains to be done by way

of making the craft more sturdy, more powerful, and better carriers of men and goods.

INTERESTING SPECIAL DUTIES FOR THE TRUCK.

"Special duty trucks" are more or less of an old story; we are inclined to think that we have seen them for every sort of special duty that could possibly be devised. That such a very broad impression may be erroneous, however, is indicated by at least one truck which has just come into extensive use in the United States.

The stake-driver truck for circus use is certainly a new one. Of course, we all know that the circus, in its travels from town to town, comes in, first and last, for a tremendous lot of stake driving. Then, too, most of us know that of late years the circus has been pretty thoroughly motorized. But nearly every person will be prepared to receive this latest innovation as a novelty.

The stake driver, attached to the rear of the truck, is a miniature pile driver, with hammer and derrick for driving and pulling stakes. The power for driving the stakes is supplied by a small horizontal gas engine distinct from the power plant of the truck. This, it will be seen, is an economy. There is no sense in using the big, powerful truck engine for this comparatively light work. It would be altogether too much like driving carpet tacks with a sledge hammer. The truck, in addition to carrying the stake driving mechanism, is used for the heaviest kind of tractive work. In the daily "trek" to the next town or stopping place it will haul two large, husky trailers, and it has a large ring on the front for the purpose of pulling loads on the reverse.

Another interesting development of the special duty truck is the refrigerator truck for hauling meat or other perishable foods. For instance, it requires two and one-half days to make a carload shipment of fresh meat from the city of Detroit to the city of Toledo by rail. With the truck, a Detroit packing house makes the trip with nine tons

of meat in less than six hours. It will, of course, be realized that the economy is not merely an operating one, but consists equally in getting the meat to its destination in better and more wholesome condition.

The body of this refrigerator truck is designed much like the standard refrigerator car. The ice tanks are filled from the top. To make the service pay the maximum return, it carries general merchandise or other goods on its return trip from one city to the other.

LEATHER BELT BY A NEW PROCESS.

An extremely interesting invention has just been made here, which is based upon the somewhat astounding maxim or theory that the more a hide is tanned the less resistant does it become. In support of this statement mention is made of the numerous pieces of leather found in ancient Egyptian stables, etc., which have successfully resisted thousands of years' exposure to the attacks of destructive agents of all kinds. Now, all of this leather goods were made of parchmented leather. In modern times samples of this class of leather may be cited in the cases of the lashes of hunting crops, the hinges of flails, etc.

The inventor, having studied the enormous resistance of parchmented leather to traction, proposed to apply this quality to driving belts; but to effect this, as parchmented leather has no elasticity, it was necessary to find a process obviating this difficulty.

The solution of the problem, as it has been worked out, is both elegant and ingenious. It consists of combining in the leather itself both the qualities of vegetable-tanned leather with those of parchmented leather. By means of considerable pressure there is indelibly impressed in the hide a pattern resembling the metal trellis-work used to form fences and for other purposes. At the point where the pressure has been used the hide becomes absolutely indifferent to any tanning material whatsoever.

This result obtained, the hide is tanned and only those parts in the interior of the meshes formed by the impression are transformed into leather, properly so-called. The interior of the meshes thus forms "compensation chambers," so to speak, with a very elastic character, while the trell pattern surrounding them offers an enormous resistance to traction. As these two qualities co-operate to obtain one common result, a driving belt of such resistance is secured that very considerable horse-power can be transmitted with far narrower belts than is now possible.

Leather in crust and horse-hide can be used in making these belts, tests with which have given such excellent results that they are now already very largely used in industrial establishments in many different lines of trade.

TESTING THE STRENGTH AND STABILITY OF MAGNETS.

Permanent magnets, usually in the form of horseshoes, are used for many purposes, and especially in the construction of magnetos for certain types of automobiles. The usefulness of such magnetos depends upon their strength and magnetic stability. These qualities, in turn, depend upon the nature of the steel of which the magnet is made, and upon the degree and efficiency of its magnetization. The initial strength and stability of a magnet should be known before it is put to work.

An instrument has been invented for determining and measuring the degree of magnetization and the stability of horseshoe magnets. A coil capable of rotary movement, to which is attached a pointer traversing a scale, is supported between two iron pole pieces. This movable system and the scale are enclosed in an airtight box. The pole pieces extend through the walls of the box into contact plates to which the two poles of the magnet under test are applied.

When a known current is allowed to pass through the coil the pointer is deflected in proportion to the strength of the magnet, the degree of which is indicated on the scale. The magnet is not affected by this test.

For testing the stability of a magnet two adjustable coils (solenoids) are provided which are located in front of the contact plates and fit around the legs of the test magnet. If a current is allowed to pass through the solenoids in the proper direction, it will demagnetize the magnet until the pointer of the testing instrument points to zero. The value of the current required to bring about this result is measured by an ammeter and indicates the degree of the stability of the magnet tested.

By this test the magnet is deprived of its magnetic power. To make it useful it must be re-magnetised. In practice the test for initial strength is applied to every magnet in a lot, while only a few samples, picked out at random, are subjected to the stability test.

The current for the movable testing coil is derived from a single dry cell, and that from the solenoids from a storage battery. The solenoid current is regulated by rheostats.

WORKING THE BIGGEST FARM IN THE WORLD.

Wheat will be harvested this next fall from the world's largest farm, which comprises over 250,000 acres of Indian lands in the states of Montana and Wyoming. The lands are located on the Crow, Blackfeet and Fort Peck Indian reservations in Montana and Wyoming. In order to make the land productive a corporation with a capital of \$2,000,000 has been organized.

On this huge farm not a horse will be used. Sixty-five tractors are now the property of the farm corporation, and the plowing record for last summer was more than an acre a minute for the working time.

Each harvester will easily handle twenty-five acres a day, and enough harvesters will be put on each 5,000 acre unit to

complete the work in ten days. Forty-five days will be allowed for the plowing. Seeding is being figured in the same way.

In the last ten years the United States government has laid out extensive irrigation projects along the river bottoms in many of the reservations. Many of these systems are now completed and being operated.

When the enterprise is fully developed it is expected that their irrigated lands will raise a crop every year, while the dry lands will raise a crop every two years. The average rainfall in that part of the country is only fifteen inches per year.

RARE ELEMENTS AS PAINT PIGMENTS.

Many of the rarer elements that have heretofore had little industrial application received much consideration during the war-time period. It is probably safe to say that many of them will henceforth be used as the bases of preparations destined to become of great importance in the industries and arts. Their possibilities as pigment bases, for instance, have for several years attracted much interest and speculation. Among the more obscure, or not commonly known, metals are molybdenum, cerium, lanthanum, selenium, thorium, titanium, tungsten, uranium, vanadium, zirconium, beryllium, and radium. Nearly all of the above metals, in the form of their respective insoluble compounds, have a high refractive index and consequently produce, when ground with oil, very opaque mixtures having a hiding power comparable with lead or zinc pigments.

ALFRED T. MARKS.

NOTES.

The latest accession to journalism in Asia is the *New East*, a copy of which has just reached us. Mr. Robertson Scott, the Editor, deserves to be congratulated on the excellent fare he provides in the Christmas number. In the Indian section, we find three special articles, one dealing with India's contribution to victory. The *New East* should prove a valuable aid for the correct understanding of the progress of affairs generally in the Asiatic continent.

Dr. Perry Nichol's, Savannah, Missouri, deserves all honour and praise from the school people of America and especially of Missouri. He has contributed to Savannah, according to the *Boston Journal of Education*, the money for an increase of twenty per cent of all teachers' salaries. It has also given \$1,000 to increase the High School Gymnasium fund for which the City has voted \$1,800. Dr. Nichols has for several years been making donations to educational institutions in several States, and also assisting a number of worthy young people in securing their education. He has come to the conclusion that in realising the future aim of education, which is to make democracy safe for the world, the high school is to be the one institution for reaching the masses, and for "dealing with democracy in the rough"; and as such the high school is entitled to the consideration of the benefactors of education. Men like Dr. Nichols are a great and growing need in this country.

A press communique says.—The Government of India have decided to prohibit with effect from the 6th September, 1919, the importation, except under license, of certain dye-stuffs (a list of which can be obtained from Collectors of Customs or from Local

Governments), from all destinations other than the United Kingdom. In order, however, to safeguard the interests of the Indian dyeing industry the Government of India desire it to be clearly understood that licenses will be freely granted for the import of these dyes from foreign countries in all cases in which the licensing authority is satisfied that it has been impossible to obtain the required dyes from the United Kingdom, either because the dyes are unobtainable therefrom or are unobtainable at a reasonable price. The prohibition will not be applied to consignments *en route* on the 6th September, nor to those which have been placed on board ship on or before that date. The licensing authorities will, in the first instance, be the Collectors of Customs at the various ports, and all applications for the import of such dyes from countries other than the United Kingdom should be submitted to them.

Those in Mysore who may be now studying the income-tax proposal of Government will do well to take into consideration the system of income-tax gradation in Canada as amended by the last Dominion Budget proposals. Under the new Dominion Scheme incomes of less than £200 per annum are exempt in the case of unmarried persons without dependants, and in other cases the exemption limit is £400. Thereafter the tax rises by a closely graduated scale. Supertax begins at the £1,000 mark, and this also is finely graduated. At the top of the scale (incomes of £100,000 and over) the income-tax and supertax amount to just over 60 per cent. How far the Canadian system is applicable to conditions in the Mysore State it is for the Legislature to pass an opinion, but it certainly has the appearance of being designed on scientific lines, which is more than can be said for the present system in force in any country, East or West.

Among other matters, the following matters were dealt with at the meeting of the Industries Section of the Board of Industries held on the 21st August, at Naini Tal. They also considered a note by the Director of Industries regarding the maintenance of the Technical Laboratory attached to his office as a separate Institution from the proposed Technological Institute. Quite apart from the research work which will probably be carried out by the latter, there is ample scope for the activities of the former institution judging from the number and variety of the enquiries which it is receiving particularly as to the application of known methods to the many problems which from time to time confront those engaged in industrial pursuits. For this reason the Board considered that it would be advisable to improve the status of the Industrial Chemist and that control over his department should be exercised exclusively by the Director of Industries. A report by the Director on the preliminary training of Mr. Vishwa Nath Sahai, a nominated State Technical Scholar for the study of the dyeing of textile fabrics in England, was also approved. The Board was asked to consider a proposal for employing for some of the Criminal Tribes which are shortly to be removed to Kalyanapur, near Cawnpore. The scheme submitted aims at providing work in the settlement, by the introduction of hand-loom weaving by means of the fly shuttle. Government would only be required to provide the necessary equipment at a cost of approximately Rs. 10,000. The Company submitting the proposal undertake to make all arrangements, *i.e.*, for the supply of yarn, and the marketing of the cloth. It will also pay the weavers a wage which equals that earned in the large factories by workmen occupied in similar work, and in addition to maintaining the equipment in good order, it will pay ten per cent per annum on the amount of the grant for such equipment, by way of interest and depreciation. The Board cordially sup-

ported the proposal, and recommended its adoption. The Board was pleased to note that Government has sanctioned the grant of Rs. 5,000 recommended at the last meeting for the purpose of carrying out experiments for making various colours and qualities of glass with soda manufactured locally and for evolving recipes for the same. It was also noted that Government has also been pleased to sanction the establishment of a school for the training of disabled soldiers in (a) motor driving and (b) management of oil engines, and a class of motor driving has also been experimentally attached for a year to the Technical School, Lucknow, for the training of disabled soldiers. The Board then considered the question of erecting a small factory for the extraction of oil from neem seeds, and submitted a recommendation on the subject to Government.

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It is announced for general information that the instructions for the issue of licenses for the export of mica which were issued to Collectors of Customs on 13th May, 1919, have now been modified as follows:—(1) Exports of mica of all descriptions are permitted under license to the United Kingdom, as at present. (2) Exports of all sizes and qualities of mica splittings and block, other than first and second qualities of clear and slightly stained ruby block of all sizes, are permitted under license direct to all destinations.

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We often hear remarks made about the "unchanging East," but in many directions India is arousing herself and adapting new methods and new machinery with amazing rapidity. The slow moving, patient bullock has been the theme not only of the casual tourist, but also of the more experienced writers of India for many years, and up till quite recently any proposal to substitute for this amenable animal any form of mechanical traction, except perhaps in the largest and busiest towns, would have been regarded as

entirely impracticable. The last five years, however, have taught us to expect the unexpected, and it is indeed a sign of the times that the question of mechanical traction for *Agricultural* purposes is now being seriously considered. We learn that, under the auspices of the Agricultural Department, a trial of the famous Fordson Tractor will be held at Coimbatore on the College Estate lands during the visit of His Excellency to Coimbatore next week. The Russia Engineering Works of Mount Road,—the local agents for the Fordson Tractor—are sending their Engineer Mr. Pickworth, who has had wide experience in this and in other countries in dealing with this tractor to carry out a thorough trial and demonstration of ploughing, harrowing and, as this engine can be used for stationery work, of chaff cutting and ginning. It is possible also that the Public of Madras will be able to see the kind of work that these tractors can do, at Guindy, where we believe another Fordson, and a Cleveland Caterpillar tractor imported by Messrs. Best & Co., will shortly be seen at work. This is a step in the right direction as the possibilities of Motor ploughing in certain conditions are undoubtedly very large.

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In this issue we publish two interesting articles on Education—one from the pen of Mr. C. R. Reddy, I. G. of Education in Mysore and the other from that of Professor Laurie, the Principal of the famous Technical College at Edinburgh.

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Among the products of the British Empire which before the War were not utilised in this country to the extent they might have been, cocoa takes a prominent place. The quantity of cocoa produced in British Countries in 1913 was more than three times the amount consumed in the United Kingdom, yet this country only obtained about one-half its supplies from those sources, the remainder consisting largely of South American cocoa

and foreign cocoa shipped *via* continental countries. Not only was this the case but we were importing large quantities of prepared cocoa and chocolate from foreign countries which had been manufactured there from British grown cocoa. During the war the position improved and a much larger proportion of the raw cocoa came from the Empire, no less than 86 per cent of the total imports into this country coming from British possessions in 1917, and it is to be hoped that this state of affairs will continue. The importance of the matter will be realised when it is stated that in 1916 the total imports were valued at no less than six and three quarter million pounds sterling. The question of the production of cocoa in the different countries of the empire, the world's consumption, and the cocoa trade of the United Kingdom is fully discussed in an article in the current number of the *Bulletin of the Imperial Institute*. Of the many interesting points brought out two call for special mention. The first is the unprecedented growth of the cocoa industry in the Gold Coast, where the product is grown and prepared for the market entirely by the natives. The Colony commenced to export cocoa in 1891 and it now produces more than one-quarter of the world's output. The other equally remarkable fact is the enormous increase in the consumption of cocoa in the United States in recent years. The consumption has trebled since 1913 and about one-half the total quantity produced in the world now goes to the States. The cocoa industry of the Gold Coast is also dealt with at length in a message addressed to the Legislative Council of the Colony by Sir Hugh Clifford, the Governor, which appears in the same number of the Bulletin.

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The Children's Institute of the Osaka Municipal Corporation is now being built at Imamiya. It is intended to carry out the following works: 1. Education : 2. Nourishment : 3. Sleep and rest : 4. Lodging : 5.

Clothes: 6. Play and exercise 7. Amusement: 8. Disease: 9. Abnormity in the body and mind: 10. Training. Dr. Takemura and three other members from among the physicians and teachers, besides, clerks, nurses and others have been nominated. The institute is intended to give advice to the citizens in the care of their children regarding the above-mentioned topics. The enterprise is considered entirely a new trial throughout the country.

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Reviewing the Annual Report on the working of the Co-operative Societies in the Bombay Presidency for 1917-1918, the Government of Bombay observe:—"No new Housing Societies were established during the year, but those already in existence appear to have done useful work, and to have consolidated their position. A great future may be expected for this type in the present congested state of Bombay which has created an insistent demand for decent accommodation amongst an educated and thrifty class of people to whom co-operation should appeal with increasing force. The recent grant of State aid in the form of long term loans on suitable rates of interest should stimulate the development of Housing Societies which have always found their greatest stumbling block to be the difficulty of attracting capital on favourable terms." In the last sentence is a suggestion for many other governments to take up.

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In mail week the prospectus was issued in London of the British Overseas Bank, Ltd., which has been formed under the auspices of a strong group of banks, including the Imperial Ottoman Bank and the Anglo-South American Bank, Ltd. It is pointed out in the prospectus that it has been increasingly evident since the termination of the war that the future prosperity of this country will be largely dependent upon the early and rapid

resumption and expansion of foreign trade, and that as a means to secure this end it is felt that increased and improved banking facilities will be necessary, and for this purpose the bank has been formed. The business of the bank will be conducted on specialised lines and effective co-operation with trade will be maintained by the presence on the Governing Council of trade interests, thereby securing benefits to the general business community as well as to the bank. The bank will facilitate the foreign trade of the British Isles and the Empire by specialising in all matters of exchange, payments, and receipts abroad, and the handling of foreign collections, documents, and securities. Commercial credits will be issued, and the bank will give its acceptance to bills in connection with Home, Colonial, and International trade, and agencies and branches will be established, if and where necessary.

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The authorised capital of the bank is £5,000,000, divided into A and B ordinary shares of £5 each, of which the A class ranks first for a cumulative dividend of 6 per cent, and after a dividend of an equal amount has been paid on the B shares, the arrangement is that in any further division of profits the B shares shall receive twice as much as the A shares. The constituent banks have taken up at par 200,000 of the B shares, and the issue made this week consisted of 200,000 A shares, 20,000 of which have been allotted to the Prudential Assurance Company. With the great advantage of the support of the eight constituent banks, the British Overseas Bank starts its career under the most favourable auspices. Of the need for an institution of this character there is no doubt, and it may be expected to play a very important part in future trade development. As to the regions with which it will specially concern itself, we note that among the constituent banks are the Imperial Ottoman Bank, with its wide connections throughout

the Near East, and the Anglo-South American Bank, Ltd. These banks are respectively represented on the Governing Council of the British Overseas Bank by Mr. E. W. H. Barry and Mr. R. J. Hose.

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Mr. Rushbrook Williams in his recently published "India in the year 1917-18," points out that expenditure from all sources on Education works out at 7 $\frac{3}{4}$ d. per head. The expenditure from provincial including central funds comes to only 2 $\frac{1}{2}$ d. per head as compared with 7s. 9d. in England and Wales. It must be plain says Mr. Williams "that until the proportion of illiterates can be raised, the immense mass of the peoples of India will remain, poor, ignorant and helpless far beyond the standards of Education in the West." He states that the rate of growth has been insufficient for the needs of the country and adds:—"An examination of the problems presented by these types of Education, and of the efforts which the administration is constantly making to solve them, reveals with greater clearness of the present position and the urgent necessity for embarking upon a largely planned constructive Policy for which money must be found in some way or other.

GLEANINGS.

The following note on boiling of Burma rice by Mr. Wibley may prove useful at the present time:—A great deal of the prejudice against this cheap and wholesome food is due to the want of knowledge of the proper method of cooking it. The method of cooking Bengal rice, by putting it into cold water and letting it boil up, must be entirely reversed in the case of Burma rice. This should be cleaned in hot water, and placed in boiling water, just enough to cover the rice, with about one inch over. It is then boiled until practically all the water is absorbed the rice then turns out flaky and palatable, and there is no reason why it should cause indigestion and similar troubles. It is said that the reason, why Burma rice should be treated differently is that is machine cleaned, whereas Bengal rice has to be boiled to remove the husks.

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Plans for the electrification of the Jamaica Railway have been completed. The engineer of the Westinghouse Company, who went into the question has returned to United States of America, taking with him the plans on which he will prepare his report for transmission to the Government. The change, if decided upon by the legislature, will involve an expenditure of at least £800,000. In the meantime six locomotives are being constructed by the Baldwin Company of Pennsylvania, to augment the rolling stock of the Railway. We in Mysore must speed up our power surveys and plans.

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The movement for the consolidation of interests in the Belgian glass industry appears to be taking root in other industries, says the *Board of Trade Journal*. According to the Press, a metallurgical trust, representing 300,000,000 francs capital, is in process of formation. It is expected, in spite of the opposition of conflicting interests, that this will embrace the whole industry. After rebuilding and re-equipping existing works, the trust proposes to build three or four large factories, each specialising in the production of selected classes of goods.

The possibility of utilising British Guiana Timber for supplying some of the requirements of European Railways, particularly in the form of sleepers, is the subject of investigation. Although British Guiana has the timber it is feared that the shortage of labour will prevent the development of a railway sleeper industry in the colony. Another difficulty is the lack of shipping accommodation. Here is an opportunity for Indian timber. Mysore can well look up and see if she cannot get a hand in it.

The Government of Jamaica has decided to develop the sisal hemp industry on the plains of the Colony. In addition to encouraging the extensive cultivation of the product, the Government has been urged to erect a factory for the preparation of the fibre for the market. This proposal will, however, be allowed to stand over a year. Meanwhile what is the progress in this new industry in the Mysore State. A return would do much good at least once a quarter.

Apropos of Land Banks in Mysore, we might state that it has been decided that the question of an Agricultural Bank for Jamaica should be laid before the Royal Commission which is expected to visit that colony in the near future. There is a Land Bank in Southern Rhodesia, which is doing much good. It makes loans to settlers on easy terms of repayment, for the purpose of improving and developing their agricultural holdings.

Two hundred thousand acres of forest land in great Britain are to be replanted, at a cost for planting and maintenance the first ten years of Rs. 21,000,000, according to announcement by the Government. The trees will replace some of the heavy timber cut down during the war, and provide additional forests so that the country may be independant of other timber sources in case of emergency.

The Government of India are making an enquiry into the causes of the perishing of paper of India, which involves premature destruction of old books and records, and it is understood that in this connection Mr. Chapman, Librarian of the Imperial Library,

will be visiting all important libraries in India containing collections of old books with the object of finding out their condition.

We note from the *Canadian Forestry Journal* that wood block paving, which in European cities has long been the favourite, is increasing in use in Canada, despite the frequent clumsy methods used by town engineers in laying it. Rightly laid it is an ideal paying material. Much wood that at present goes to waste in this State can be collected and exported to benefit.

The Wheat Commission estimates that the loss on bread subsidy in England during the current financial year would come to £47,900,000. It further estimates that without control or subsidy the price of the flour pound loaf would come to 1s. 1d. instead of 9½d. The loans and taxes, of course, provide funds for meeting the loss on this subsidy.

The City Authorities of Brussels have decided to hold the National Industrial Fair in April, 1920, instead of next September, as originally intended. Reconstruction is proceeding rapidly in all industries, but it is natural that many would-be exhibitors are not ready to participate in a Fair this year.

Upwards of 600 small diamonds have been recovered in the Gold Coast Colony from the shallow quartz gravels of the Abomo stream and the adjacent ridge some 65 miles to the North West of the Accra, the capital of the Colony.

The advisability of electrifying the South African Railways or portions of the system is being studied by the Union Government. Arrangements have been made to secure an expert report on the matter.

Tropical Life for July, 1919, is as interesting as ever. Sir Alfred Chatterton's paper on "Sisal Cultivation" published in the April issue of this *Journal* in extracted and favorably referred to.

A large fruit cannery is to be erected at Port Elizabeth by the African Canning and Packing Company (Limited). The capital of the Company is £50,000. We are still debating on the subject in Mysore!

TOPICS FROM ECONOMIC PERIODICALS.

RURAL PRIMARY EDUCATION.

In the Social Service Quarterly for July, 1919, there is an interesting article on Education in Rural Primary Schools by Mr. S. H. Fremantle, I.C.S. He writes:—

Among the foremost problems of reconstruction in all countries is that of education. The stern ideal of War has brought all theories to a test. It has shown us more clearly than ever before that the true wealth of a nation is in its citizens, and has done much to make clear the defects of the various national systems of education. The British system, perhaps, has given better results than were expected of it. The national schools of the masses have produced their heroes of field and sea and air, as well as the public schools of the classes, and the standard of honour, cheerfulness and discipline has probably been higher in the British than in any other army. But many defects have come to view—the large proportion of men, especially in the towns, found to be physically unfit, the neglect of the sciences and of the application of science to industry, the limited outlook and undemocratic atmosphere of the public schools, the failure to provide a highway for clever boys from primary to secondary school and university thus allowing much talent to go to waste, and, lastly, the turning out into the world at the age of fourteen of 90 per cent of the boys of the country, with the result that very many youths take up blind-alley occupations which lead to nothing and so swell the number of unskilled labourers. The case was considered so urgent that at the very height of the War, a trained educationist (Mr. Fisher) was for the first time appointed Minister of Education, and all parties combined to welcome the Bill which he introduced in 1918. The principal object of the Education Act is "the establishment of a universal system of continuation schools," in which boys and girls between 14 and 16 (and after the lapse of 7 years between 14 and 18) will be given a part-time education. But the Act does much more than this. For it defines the responsibility of the local educational authorities for preparing schemes for the progressive development and comprehensive organization of education, and makes provision for nursery schools, for attention to health and physical training, and for the adequate linking up of primary and secondary education.

In India, there has been no approximation to the war conditions of Europe; but she has not remained unaffected by the general world ferment. Many thousands of her sons have served in Europe and in distant quarters of Asia and Africa, and have returned with new ideas of men and things, while the economic disturbance due to the War has affected even the remotest villages. Here again it was in the very height of the conflict that India's new charter, the announcement of 20th August, 1917, was promulgated. By it the ideal of Self-Government within the Empire was first definitely accepted by Government, and in working out the first steps to be taken towards the attainment of this ideal it has been decided for better or for worse that democratic principles must be introduced, and the powers now wielded by the official classes be placed in the hands of the representatives of the mass of the people, the great majority of whom are still illiterate. For, according to the report of the Southborough Committees, there will be over 5 million voters. An urgent need has, therefore, arisen on political grounds for the wider diffusion of primary education. On economic grounds also a quicker advance is necessary. The scarcity of shipping and the restrictions on exports from the belligerent countries have drawn prominent attention to the economic weakness of India, and the operations of the Munitions Board, assisted by private enterprise, have laid the foundations of many industries, which under the fostering care of Government will enable the abundant raw material of India to be worked up in the country itself, and so largely increase the demand for a skilled and intelligent labour supply. At the same time, the more general diffusion of improved agricultural methods and machinery is increasing the need for a more intelligent and enterprising peasantry.

With these converging reasons impelling an educational advance, it is not surprising to find that in most provinces Bills have been introduced in their respective Legislative Councils allowing local bodies to make education free and compulsory within their jurisdictions, and that much larger sums of public money are being devoted to the extension of primary education, for the opening of new schools, for the increase of the pay of teachers and of facilities for training them, and for the provision of new schools buildings. The aim is no less than to remove the reproach of illiteracy from India and to make primary education ultimately universal throughout the country.

The measures noted above for the immediate diffusion of facilities for primary education must, of course, have the effect of extending some degree of literacy among the masses; but if our efforts are

to end there, it is probable the result will be disappointing. There will no doubt be a largely increased attendance, but much of it will be on paper, and though more boys will attend school for short periods they will leave with a very rudimentary knowledge of the three R's, which in the atmosphere of an Indian village they will very soon forget. In his book 'Across the Bridges,' which is an illuminating review of the social conditions prevailing in the poorer portions of South London, Mr. Patterson tells us that even there many boys after several years of school practically relapse into illiteracy. If this is the case in the metropolis of the world, how much more will it be the case in India! Further, since the schooling facilities already provided are in most places not being utilised to their full capacity, those classes who do not see the advantage of education, and, therefore, do not now send their sons to school have to be taught to do so either by persuasion or compulsion. There are no doubt certain towns, and perhaps certain districts or portions of districts where the proportion of boys now under instruction is so high that compulsion may be properly employed to bring in the remainder; but the greater portion of the country is too backward to allow of compulsion, and persuasion must, for the present, be relied on to fill the schools.

There are, therefore, two excellent reasons why it is incumbent on us now to examine our present system of education in order to satisfy ourselves that it fits the needs of the country: firstly, as very large sums of public money are now to be expended on the extension of the system, it is necessary to see that the money is profitably spent; and, secondly, because those classes who do not send their children to school have to be persuaded or compelled to do so, it is necessary to satisfy ourselves that the education imparted is of the right kind.

In a pamphlet published in 1915, called "A System of Rural Education," I have endeavoured to point out the defects of primary instruction as it exists in the rural tracts of the Upper Indian Province with which I am acquainted, and I do not think that the position in other provinces is very different. The main defect was and still is that the education given is wholly literary, and is not co-ordinated with the life of the people, and especially with agriculture, the main interest of the country, side. A boy when he walks into the school compound enters a new indoor life of books and paper and sums quite unconnected with his outdoor life at home in which the sowing, tending, and reaping of crops, and the care of animals are the chief interests. The school times and seasons are not fixed to fit in with agriculture. The teachers, though in nearly all cases villagers themselves, are trained in an urban

and literary atmosphere. In these circumstances, it is surely not surprising to find that there is no idea of sending a boy to school in order that he may become a better cultivator or a more intelligent citizen. A boy is sent to school in order that by learning to read and write he may qualify for literate or semi-literate employment, and so earn some small monthly salary to help the family budget; or when a boy is still too small to be of use in agriculture or industry he is sent to school for three or four years to keep him out of mischief. In the latter case, he is removed when he becomes old enough to work and before he can read and write correctly, so that he speedily forgets nearly all that he has been taught. If this is education in practice, the measures now being taken for the extension of education can bear little real fruit.

The remedy, so far at least as rural schools are concerned, must surely be the introduction of an agricultural atmosphere, so that the life of the school may be co-ordinated with the life of the home. To achieve this purpose the following steps can be taken:—

First:—The training of teachers. Normal schools and training classes should be situated not in crowded towns, but in villages or on the outskirts of small towns where agricultural land is available. To all such institutions a garden should be attached, and, if possible, a small demonstration farm worked under the advice of the Agricultural Department. The curriculum should include a course of rural science teaching in which the elementary sciences are taught in rational co-ordination with one another. No person is fit to be a teacher of a child if he cannot answer the common questions in natural history and physics which every healthy child asks, and the regular school subjects cannot be made interesting or practical for the sons of agriculturists without constant references to rural science. The number of normal schools is quite inadequate and the hasty improvisation of training classes attached to ordinary schools in order that a large proportion of the teachers may be classified as "trained" does not really meet the needs of the case.

Second:—All schools of any size should have gardens attached, comprising.—

(1) A small ornamental garden of flowers and flowering shrubs to beautify the school building, (2) a shady portion which can be used not only for physical exercises and games but for an open air school to supplement the accommodation in the school-house. For this purpose it would be necessary to have platforms of earth covered by light sheds during the rains, (3) individual single or dual plots where the boys can grow any flowers or vegetables they fancy, (4) a small field to be used for

demonstrating the growth of such varieties of crops and vegetables as may be recommended by the Agricultural Department, (5) an orchard of fruit trees of various kinds, and (6) a nursery of trees to be given away or sold.

Such a garden has been described by the present writer in the March number of the *Agricultural Journal of India*. It would average about two-thirds of an acre in size. It would require an enclosure wall to keep out animals and thieves, and, unless situated in a canal tract, a good well. It is also essential for the success of the gardens, as well as desirable on other grounds, that a small house with court-yard be provided for the head teacher, and also if possible bachelor quarters for one or more assistant teachers. On the other hand, a large school-house would be unnecessary since extra pupils would be accommodated in the garden as explained above.

The objects of school gardens have been defined in the article mentioned above to be the following :—

- (1) To beautify the surroundings of the school,
- (2) To limit expenditure on school buildings,
- (3) To introduce an agricultural atmosphere into the school,
- (4) To interest parents, school committees, and the public in the school as a village institution,
- (5) To stimulate in the neighbourhood interest in new vegetables, crops and varieties and to introduce to the locality such as may be found suitable,
- (6) To inculcate in the minds of the boys the dignity of labour, and introduce them to the spirit of service for the community,
- (7) To emphasize the importance to be attached to agriculture, and
- (8) To provide examples for the teaching of geography, arithmetic, mensuration, and kindred subjects and material for nature study.

A natural development is an exhibition at district quarters of the produce of school-gardens which can be combined with an exhibition of products of other departments of the schools, such as drawing, needle-work and basket-weaving.

Third :—Mathematical and other text-books should be adapted to an agricultural population, and questions and problems contained in them should be such as arise in actual practice in field, garden, and bazaar. A new arithmetic for vernacular schools was recently approved in one province, the examples in which contained from first to last no mention of seed, cattle manure, irrigation or even of the rent of land.

The examples were all drawn from the commercial life of a European country.

Fourth :—The school times and seasons should be such as suit the convenience of agriculturists. That is to say that the school vacations should be liberal in length, and should coincide with the principal harvest or harvests. On the other hand, the holidays given on account of religious festivals and fasts should be confined to those actually necessary in the circumstances of a particular school. There appears to be no necessity in non-Christian schools, any more than in mills and factories, to allow a Sunday holiday where there is a sanctioned holiday two or three days before or after Sunday.

In this connection, it is at least worth consideration, whether the attempt to make primary education universal will not be more quickly realized if the aim be not too high, and at least in rural tracts a system of half-time instruction be generally introduced instead of the whole-time system now prevailing. Children of working agriculturists either do not come to school at all or else come only while they are very young. If the curriculum were altered so that they could complete the course by attendance for say three hours in the morning or evening, it is very probable that their parents would allow them to stay on in the school even after the age at which they become useful in the fields, and so the "formative" years between 12 and 14 would not be wholly barren of educational growth. An experiment on these lines is being tried at Allahabad and gives promise of being successful. The saving in the cost of buildings is obvious. For only half the boys in the school need be present at one time, and while most villages can provide some verandah or shed in which 25 boys can be seated fairly comfortably a special building would probably be required to accommodate 50 boys. Instruction too would be more efficient since more individual attention could be given to the pupils. Lastly, there would be a special advantage from an educational point of view. For boys of tender age cannot be learning for more than three or at most four hours in the day, and if they remain, as they frequently do, double this time in the school they are not making the best use of their time; for the teachers have neither the competence nor the desire to show them how best to employ their leisure. Until schools are better formed and teachers are more competent and alive to their responsibilities for educating as well as for instructing, children had better spend the time they are not in class at home helping their parents in light tasks and getting that practical education which is not provided in the school.

Fifth :—If, however, the rural schools are to retain their whole time system, much can be done to

brighten the lives of the children and train their bodies by the introduction of organized games and action songs. At present, such training is confined to drill and physical exercises. Some drill is no doubt required for disciplinary purposes, but it should be of the simplest character, while physical exercises are only suitable for the older children and should occupy only a few minutes in the day. The only games, so far as I have seen, encouraged in schools are English games, which require more or less expensive materials, and are, therefore, unsuitable for village schools. There are, however, several excellent indigenous games which are played without materials, and deserve to be more generally known and practised. Some action songs too have been adopted for Indian children and are much appreciated in the few schools where they have been introduced. They should be generally adopted in girls' and infants' classes.

Sixth:—If the schools were in touch with the agricultural life of the people, and the sons of working agriculturists were allowed by their parents to stay on in the part-time schools till they had completed the primary course, an opportunity and a demand would arise for continuation classes in special branches of agricultural science to be conducted at convenient seasons in central schools by peripatetic instructors, specially trained for this purpose.

Seventh:—The division of the whole country into school districts with one or more large central schools, and, if necessary, small feeder schools located at convenient places and the constitution of school committees for such districts are urgent needs. In a few provinces, some progress has been made towards such an organization, but it has nowhere, so far as I know, been perfected and carried to its logical conclusion. For even where districts have been defined and committees appointed, no real responsibilities have been given to them and the schools are, on their economic as well as their technical side, entirely controlled and managed by the inspecting staff. It will no doubt be said that in some places school committees have been tried and have not proved successful. And it is no doubt true that it is useless to appoint a committee unless firstly definite and responsible duties are given to its members, and secondly efforts are made by the local officers of Government and the District Board to train the committees to carry out the duties assigned to them and to encourage them in any efforts they make to overcome local apathy and factious opposition. In some places, it might be best to nominate the committees, in others to elect them, and the school district might be the electoral

unit of the local government system. But whatever constitution be adopted, the formation of responsible and representative school committees would not only create in the community an interest in the schools but would afford a first and much needed introduction to real local self-government.

Eighth:—The recognition of the school by the local authorities and residents as the centre of public life. Durbar Day and other special holidays might be commemorated by the organization of entertainments, sports, and illuminations. Religious plays might be performed and recitations made from religious books out of school hours, while when peripatetic agricultural inspectors are available the school might be made the centre of their demonstrations. School libraries and museums are natural developments useful to the general public as well as to the school children themselves. All activities of this nature tend to popularise the school and to make it fit in with the life of the people.

Ninth:—There is the encouragement of teachers. Much is being done to increase the number trained teachers, and some suggestions for improving the training of those destined to teach in rural schools have been noted above. Steps are also being taken to improve their salaries which are still miserably low in comparison, for instance, with those of skilled artisans. These measures will have some effect in improving their status and influence. But it will be impossible for many years at any rate to train all teachers as they should be trained and to pay them all as they should be paid. With longer harvest holidays as proposed above, courses in special subjects, such as nature study and rural economics, and special branches of agriculture, such as seed selection and plant diseases, could be introduced, and teachers' conferences arranged at which teachers would be brought together to compare notes of their work and to have their minds enlarged by fresh experiences. The teacher might be, as he is frequently in America, and as he is entitled to be, by his education and position, the leader and guide of the whole rural community, and the school would then be, as it should be, the centre of rural life.

Tenth:—Closely connected with the last two suggestions is the necessity for the development of a body of public opinion in favour of a better and broader policy of primary education. The latter has suffered by having no directing authority of its own and by the greater interest taken by the upper middle classes in secondary and higher education. In order to educate public opinion in the matter, I should like to see formed an association, the members of which engage to estimate educational results by quality as well as by quantity, to study educational

principles and the latest developments of practice in other countries, and to endeavour by close acquaintance with practical conditions in the various parts of India to indicate how to adapt them for local use.

These are some of the directions in which it seems to me our rural school system requires to be reconstructed. The great secret of successful education lies in interest—interest of the pupils in their work, interest of the teachers in their pupils, interest of the parents and villagers in the school, and interest of the local authority and the educated public in thinking out a sound system and watching over its working.

At present, the system is cold, lifeless and artificial. The children are bored with unfamiliar literary work and this attitude of boredom naturally reacts on the teachers. The parents regard the school and the instruction given in it as something quite apart from village life, while the local authorities, the inspecting staff, and the educated public too often regard it merely as a machine for passing boys through certain standards and examinations.

What a change it would be if the children's minds were opened and their interest aroused by introduction to and explanation of the mysterious processes of nature, if teachers were not only able to explain these things to their pupils but had been led to study and were prepared to discuss with the leading residents the rural economy of their neighbourhoods, if local men were given some definite responsibility for the successful working of the schools, if parents and villagers were to gain some acquaintance with new varieties and methods by the demonstration work going on in the school gardens, and if local authorities and their staff and the local magnates encouraged these and other wholesome activities by all the means in their power!

An intensive movement of this kind would surely do more for the production of that body of intelligent citizens which is admittedly so necessary than the compulsory extension of education to all and sundry which is now being feverishly pressed forward in many quarters. Until the objects and results of education are better appreciated by the general public, its artificial extension will have little good result and is likely indeed to defeat its own object by antagonising parents. On the other hand, the reconstruction of the school as a living organism in village life would involve real and steady progress and would lay the foundation of a new and better rural social order.

CALCUTTA UNIVERSITY COMMISSION REPORT.

The Times (Educational Supplement)

says:—

A superficial criticism of the report of the Calcutta University Commission might be made without reading so much as a paragraph, on the ground that it fills five substantial octavo volumes. But length and prolixity are not synonymous, and skilful arrangement permits of the main conclusions being well understood after half-an-hour's reading. The thoroughness of the survey has been disadvantageous in one respect, for it has provided an excuse for the five or six months occupied in the mere mechanical work of production from a Government press which, apart from routine duties, has been mainly absorbed in the issue of papers connected with political reform. Those who complain of the vast surface covered by the report would do well to remember the difficult and complex issues covered by the terms of reference.

Lord Chelmsford announced the decision to establish a Commission in his speech at the annual convocation of the Calcutta University early in 1917. Distinguished educationists in this country had to be approached, and the Commission was not formally appointed until the following September. Sir Michael Sadler and his colleagues began their work in India towards the end of November. The hope that one cold-whether season would suffice for the inquiries was not fulfilled. They extended over two seasons, and the intervening summer was a time of strenuous labour for the Commissioners. While they were primarily concerned with Calcutta, they visited collegiate institutions throughout the country, in accordance with pledges made in the Supreme Legislature, and the recommendations made, broad in principle though not in full detail, are of general application to secondary and higher educational policy throughout the country. Visits were made to most of the colleges and many of the high schools of the country districts of Bengal, while conditions in Calcutta were the subject of thorough investigation at first hand. In a word, the Report makes a far more complete survey of the problems of Indian education than any that has hitherto been attempted.

When making the first announcement, Lord Chelmsford said that the Commission would be on similar lines and with terms of reference following those of the Royal Commission on the University Education in London. This body, presided over by Lord Haldana, was appointed in February, 1909

and presented its final Report in March, 1913. The inquiries of the Calcutta Commission covered, not four years, but less than 18 months, though the problems for consideration, like the geographical range of investigation, were far wider and more complex than those of its prototype. To say nothing of visits to other parts of India, no other university in the world approaches Calcutta in the magnitude of the number of students under its control or the scattered nature of the affiliated colleges. Its jurisdiction extends over an area of 376,000 square miles, comprising a population of nearly 65½ millions. The Senate controls 29 per cent of the total number of colleges in British India, and within its area there are close upon half the high schools of the country.

A Calcutta telegram has pointed out that the fact that the Indian political problem is, in its roots, essentially an educational problem, and that the educational system established at the beginning of the Victorian era has, in the main, determined the form of the political movements to-day, gives the Report great political importance. It follows that the recommendations will be examined with solicitude and keenest vigilance by Indian political leaders, especially in Bengal, where there is an almost religious faith in the benefits of higher education. It is an enormous advantage, in this connection, that unanimity has been reached on all the main issues by the four educational experts from this country, the two Indian members, and head of the Education Department in Bengal who constituted this strong Commission. The only reservations—and these upon non-essential points—are by Dr. J. W. Gregory, of Glasgow, and Dr. Ziauddin Ahmed, of the Mahomedan Anglo-Oriental College, Aligarh. The other Indian member, Sir Asutosh Mukerjee, a Judge of the High Court of Bengal, has been the strong dominating force in the Calcutta University Senate for many years, and it is highly significant of the clamant need for reform that he should assent both to the depressing survey of present day conditions and to each of the comprehensive recommendations for complete reconstruction and reorganization.

The Report has a crucial bearing on those problems of material prosperity and social reform which are of at least equal importance to political change. One aim of the Commission has been to devise new facilities for technological training, which is now admittedly meagre and insufficient. It is scarcely possible to exaggerate the potentialities of Indian industrial and commercial development at the present time, and it is lamentable that comparatively little is being done to train the youths of Bengal for the opportunities the new era will bring. Sir Michael Sadler and his colleagues are convinced that an improved secondary education for boys, *i.e.*, one of

the chief conditions upon which the industrial development of the province will be found possible. They have made proposals for the old tradition of high school studies, now too exclusively leading to careers in law or Government service, to be modernized without being deprived of the equality of liberal culture.

The proposal that the university course proper should begin after the present intermediate examination is the pivot on which, in this respect, the scheme of the Commission turns. Under their plan, in the last two years of higher secondary education a boy will be able to choose between courses which will prepare him respectively for the university or for an industrial career, or for agriculture, or for teaching, or for the more subordinate posts in the Government service. Sir Michael Sadler claims that under this and co-ordinated proposals industry and business will have at their command large stream of well educated and physically efficient recruits ready, at about 18 years of age, to enter upon the duties of practical life. There are many signs that under the pressure of poverty the old prejudices against an industrial or a commercial career are breaking down. Hence these proposals come at the appropriate stage in the moral and material development of Bengal.

SPEECHES AND PRONOUNCEMENTS.

FLAX GROWING IN THE EMPIRE.

Interim Report of Committee.

In February, 1918, the Empire Flax Growing Committee was appointed by the President of the Board of Trade to investigate in all its bearings the question of increasing the supply of flax in the British Empire. Lord Colwyn was the Chairman, Sir Frank Warner the Vice-Chairman, and Mr. J. A. Todd Secretary. This Committee has now issued an Interim Report on the general situation and prospects of supply.

SUPPLY OF FLAX FIBRE.

The problem of flax supply involves the consideration of two questions. The first question, that of the supply of fibre, is closely dependent on the second, namely, the provision of seed, but the considerations affecting the two questions are so different that it has been desirable throughout this Report to treat them separately. The following table, based on normal pre-war figures supplied by the Board of Trade, gives the world's commercial crops (*i.e.*, excluding domestic consumption) and the mill consumption of the chief flax manufacturing countries :—

	Normal Commercial Crop pre-war.	Normal Mill Consumption pre-war.
In thousands of tons.		
Russia ...	400	80
United Kingdom ...	12	100
Belgium ...	24	130
France ...	20	48
Germany and Austria.	36	140
Other Countries ...	14	8
Total ...	506	506

It would not, says the Report, be safe to take these figures as anything more than a rough approximation to the actual position, but the only further information available is that Russia's total pre-war product was normally about 500,000 tons, and of this about 250,000 tons was usually exported. About 80,000 to 100,000 tons were consumed in the Russian factories, so that in the absence of direct statistics

we must infer that about 200,000 tons of the Russian crop were used up by domestic consumption. It is estimated that of the annual requirements of the United Kingdom before the war, which, as indicated above, were normally about 100,000 tons, Ireland contributed some 10,000 tons, Belgium, France, and Holland together about 10,000, and Russia about 70,000 to 80,000 tons.

EFFECTS OF THE WAR.

The effect of the war upon all these external sources of supply was nothing short of disastrous. The flax growing districts in Belgium and parts of Northern France were the first to be overrun by the enemy, and the collapse of Russia in 1917 practically removed the principal remaining source of supply. The Dutch crop has also been very seriously reduced by war conditions, while the share of that crop obtainable by the United Kingdom was reduced to a minimum. The districts where Russian flax is produced are still not freely accessible to the British industry, while the free export of flax from Belgium, Holland, and Northern France is unlikely to be resumed for some time to come. The question of obtaining supplies from other sources, therefore, became during the war, and still is, of the first importance for the British linen industry. As the result of the abnormal conditions created by the war there has been a marked development of flax growing in England and Scotland, a substantial increase in the acreage in the North of Ireland, and a considerable extension of flax cultivation in the South of Ireland. There has also been an encouraging development of other flax fields within the Empire. Although these abnormal conditions may before long be modified, the present condition of the supplies of flax is still far from satisfactory, and the future prospects of the linen industry of the United Kingdom are threatened by a shortage of supplies.

The Committee, therefore, feels that the Government support which has been given during the War (1) to foster the revival of flax growing within the United Kingdom, and (2) to encourage its extension throughout the Empire, will require to be continued for a further period. What has been done in each of these sections is described in the Report, from which we give the following summary :—

THE UNITED KINGDOM.

Until well into the nineteenth century flax growing was a considerable industry in practically all parts of the British Islands. The reason which led to the almost complete disappearance of the crop from England and Scotland may be described as a combination of economic conditions which made it no longer profitable, *e.g.*, the increasing labour cost and the difficulty of getting labour owing to the

general movement of rural population into the towns, and the low price at which flax could be imported from Russia. A few mills, dependent almost entirely on imported raw material, still remained in the South of England, while Dundee and Dunfermline carried on a large spinning and weaving industry, second only to that of the North of Ireland in importance. In Ireland, however, flax growing persisted on a much larger scale, not only because the climate seems to be peculiarly suited for it, but also because the spinning and weaving of the resultant fibre had there been developed on a large scale in the North; principally, however, because the crop suited the small farmer class who form the majority of the Irish rural population. Even before the war, however, the general situation of the trade with regard to the supply of its raw material was becoming unsatisfactory. Consumption had overtaken production, and manufacturers were faced with scarcity.

RECOVERING THE FIBRE.

The Committee soon realised that the problem of increasing the production of flax was not only an agricultural but an industrial one. Given a supply of seed, excellent flax can be grown in many parts of the Empire, and the United Kingdom itself is probably unsurpassed both in soil and climate for the growth of flax. The real difficulty arises from the fact that the harvesting of the crop and its preparation for the spinning mills involve a demand for labour which is difficult to meet under the present system of working in countries such as the United Kingdom, where labour is scarce and dear. No such difficulty arises in the production of seed, either for linseed or for sowing for fibre. Where no attempt is made to recover the fibre, as in Western Canada, the crop can be harvested and threshed by the ordinary machinery used for all cereal crops. If there is to be any permanent increase of the acreage under flax in the United Kingdom, there will have to be an entire change in the system under which the crop has formerly been grown and handled. Under the system prevailing in Ireland the farmer not only grows the flax but also puts it through the first manufacturing process, known as "retting." The next process, known as "scutching," is also done in small local scutching mills, generally on account of the farmer. Thus what the grower sells is not simply raw material, but a partly manufactured article, the trade being in this respect almost unique. The objection to this system is that in effect it limits the production and greatly restricts the possibility of improvement in the quality of the product.

It has now become generally accepted that it is necessary to introduce an entirely new method,

which has already been instituted in various experimental areas, some of which date back considerably before the war. The new system is that the flax should be bought from the farmer "on foot," as it is called (*i.e.*, as a standing crop in the field), or delivered, pulled and dried, and that the whole process of retting should be undertaken by the purchaser, who, working on a large scale and at centralised points in well-equipped factories, would be able to have the best machinery and appliances of all kinds for the purpose. At the same time, by introducing the process of controlled retting with artificial heating of the water, this system would get rid of the limitation of time imposed by the shortness of the season available for natural retting, so that a longer period would be available for the handling of the year's crop.

Probably the greatest permanent difficulty in securing an adequate production of flax in this country, either in Ireland or Great Britain, is the labour supply for the actual harvesting of the crop. Flax must, if possible, be pulled, not cut and the difficulty of getting sufficient labour to handle the crop just at the time when other crops are ready for harvesting has been so great as to require in England and Scotland special arrangements for imported temporary labour. The measures which have been adopted at considerable expense during war time would not be available, even if they were profitable in peace time, and it is greatly desired that some mechanical means of getting over this difficulty should be discovered. Several varieties of pulling machines have so far been produced, but all of them are apparently still more or less in the experimental stage. Complete success in this direction would, however, alter the whole question with regard to flax growing, especially in Great Britain.

WAR MEASURES.

In view of these explanations, it remains to describe what has actually been done during the war in the direction of securing an increased supply of home-grown flax. Ireland is the one part of the United Kingdom where the flax growing industry has survived. It is, therefore, to Ireland that we must look for the greatest development of the industry in the United Kingdom. The area under flax in Ireland in 1914 was 49,000 acres, and in 1918, 143,000 acres. But for the shortage of seed and the want of a sufficient number of instructors, the acreage, it is stated, would have been still greater in 1918. Flax is grown in almost every one of the thirty-three counties in Ireland, but mainly in six of the Ulster counties. In the North of Ireland, therefore, it is not a question of starting or reviving the industry so much as extending and developing an already existing industry.

The Committee, besides examining witnesses from Ireland, had the benefit of the report of a Committee appointed by the Irish Department of Agriculture and Technical Instruction in 1910, to enquire into the Irish flax-growing industry. Although previous to 1910, there had been for several decades a gradual decline in the area under flax in Ireland, the Departmental Committee was of opinion that the area was again on the up grade, and was convinced that in future flax growing in that country could be continued and extended. The Committee place on record its sense of the importance and value of the work done by the Irish Department of Agriculture and of the necessity of its being pushed on and considerably extended at the earliest possible moment. In addition to the efforts of the Irish Department of Agriculture to revive the industry in Ireland, private enterprise has taken up the question. The Flax Society, Limited, with the assistance of the Government, set on foot a scheme which had in 1918 about 10,000 acres under cultivation, mainly in the north of Ireland. The Fibre Corporation (Ireland), Limited, who also began work at first (some time before the war) in the north of Ireland, have extended their operations to the south, and had in 1918 an area of 800 acres under flax there.

Though flax growing is at present confined mainly to the north of Ireland, there appears to be no good reason why it should not be extended to other provinces where the soil, labour, and other conditions are suitable. A very great extension of the acreage outside of Ulster is possible, and already considerable expansion has taken place. In Cork the acreage increased from 209 acres in 1914, to 3,053 acres in 1918. In Mayo and Sligo the increase was from 241 acres in 1914, to 1,688 acres in 1918. Owing to the earlier season the south of Ireland is more suited climatically than the north for drying the straw and saving the seed, and one of the lessons of the war has been the importance of not relying entirely upon a foreign seed supply as has been done in the past. The Committee is anxious to secure the establishment in the south of Ireland of one or more flax-manufacturing units which will undertake the experiment of producing flax fibre on the factory system, as against the old system whereby the crop was handled by the farmer after pulling.

FLAX GROWING IN ENGLAND AND SCOTLAND.

For some years before the war the question of increased flax production in England had also been receiving consideration. In 1911, D. J. Vargas Eyre was requested by the Development Commissioners to enquire into the possibilities, both from a scientific and practical point of view, of reviving the flax industry. As a result of his report the British

Flax and Hemp Growers' Society, Limited, was established in 1912 with a grant from the Development Commissioners. About the same time Leeds University had taken the matter up and an experimental station was established at Selby. In 1917, these efforts were combined under one organization as the Flax Production Branch of the Board of Agriculture, which has work now going on in various parts of England and in Fifehire. The following are figures of their acreage in 1918:—Somerset and Dorset, 3,450 acres; Yorkshire, 3,755 acres; Lincolnshire, 3,173 acres; Suffolk, 1,802 acres; Fifehire, 1,357 acres; total, 13,537 acres.

In all these cases the work is being carried on in central retteries with all possible appliances for handling the crop in the most approved way. The results are being closely watched and will be of the greatest value for the future guidance of the industry. The Committee forwarded to the Board of Agriculture a strongly-worded resolution to the effect that the work of the Flax Production Branch should be continued and developed to the greatest possible extent in 1919, so that information may be obtained to guide it in deciding upon a policy for after-war development. As a result of this it was decided to extend the area in 1919, to 20,000 acres. In the meantime it may be sufficient to say that the work already done has proved conclusively that excellent flax can be grown in many parts of the country and that the problems still to be settled are mainly industrial and mechanical rather than agricultural.

SEED SUPPLY.

The Committee has been greatly impressed by the fact that in 1914, the flax growers of the United Kingdom were totally dependent for their supplies of seed upon Russia and Holland. Russia has been the original source of supply of all seed for fibre. The seed used in Ireland was partly imported direct from Russia and partly drawn from Holland as "Riga-child" or "Grandchild," after being cultivated one or two years there. The result of this dependence upon foreign sources of supply was experienced towards the close of 1916, when Ireland was faced with the prospect of a serious shortage of seed for 1917 sowings, and at the request of the Irish Department of Agriculture and Technical Instruction the War Department took charge of seed supply. Various emergency measures, including the organization of purchase in Russia and Holland on Government account, the establishment of special shipping arrangements, and the introduction of considerable quantities of Japanese seed were carried through by the War Department and the Flax Control Board, by whom the problem has been most efficiently handled, with the result that there

has been no very serious scarcity. The question, however, will not cease to be the cause of grave anxiety and considerable expense until a safe and satisfactory supply can be secured within the British Empire. The Committee is of opinion that this is a commercial possibility.

The fact that there was no native supply of seed in Ireland before the war was again due to the system of natural retting already referred to, which was universal in Ireland before the war. Owing to the short time available there was no time to remove the seed before retting; the seed, was, therefore sacrificed to the necessity of early harvesting, for the flax was generally pulled green before the seed had ripened. Thus in Ireland until 1917 practically the whole of the seed was lost, and a fresh supply had to be imported every year. This question of seed supply has so far proved to be the limiting factor in the development of an increased supply of fibre during the war.

PROVIDING A HOME SUPPLY.

As a first step towards meeting this difficulty by the provision of a home supply, the Army Council in July, 1917, made an Order under the Defence of the Realm Regulations that the seed from not less than one-eighth of the crop must be saved, and this has already resulted in the provision of an amount of home-grown seed which has materially eased the situation. But the radical cure for the former state of affairs is more likely to be found in the general adoption of the system of central retting above described. Under that system the straw would be de-seeded before retting, and various machines for this purpose have already been invented. The Fibre Corporation adopted this method, and some of the seed thus saved in the early years was used in Ireland in 1917, and proved exceedingly useful. The question of seed supply, however, turns upon another point of scientific difficulty, namely, the suitability of different varieties of flax seed for growing for fibre purposes. There seems to be two well-marked varieties of the flax plant, botanically the same, and practically indistinguishable in the seed. The one grows about 18 inches high, is much branched, and carries a heavy crop of seed. It is generally sown widely so as to allow of ample branching. The other, if sown thickly, grows unbranched to a height of about three feet, and carries comparatively little seed. The former variety is grown for linseed only, in the Argentine and elsewhere, and it has not hitherto been found possible to extract any useful fibre from it. The latter variety is cultivated exclusively in all countries where flax is grown for its fibre.

SEED PRODUCTION IN CANADA.

Steps were taken by the War Department during the summer of 1918, to induce farmers in Canada to take up the growing of flax for seed on a large scale. A contract was entered into with Messrs. E. R. Wayland and Co., of Winnipeg, who undertook to distribute to the farmers Japanese seed provided by the Government, to superintend the growing of the crop, and finally to arrange delivery of the seed at the Atlantic ports. In 1918, 30,000 acres were sown in this way, and the results obtained were very satisfactory in spite of a bad season. The Committee has recommended that the contract with Messrs. Wayland and Co., should be continued on a smaller scale for the year 1919, and feels sure that some scheme of this kind will be necessary to secure an adequate seed supply, at any rate, so long as the present disturbed condition in Russia continues.

The scientific question of how far the character of the seed may be affected by the way in which it is sown, if persisted in year after year, still remains to be settled. It appears that flax is a soft fertilised plant, and it is difficult to believe that its character could change permanently in the way indicated, but there seems to be room for considerable further enquiry into the matter.

FLAX GROWING IN THE EMPIRE, CANADA.

In Canada flax has always been grown for fibre purposes on a relatively small scale in the Eastern Provinces, especially Ontario. Efforts made in 1917 and 1918 to increase the area under fibre flax in Eastern Canada have met with considerable success, and the area in 1918 amounted to 13,000 acres. In Western Canada the problem was to induce the growers to use the imported Japanese seed (in place of the Canadian common which they have hitherto grown for linseed only) for the purpose of producing fibre seed for use in other parts of the Empire, such as Eastern Canada and the United Kingdom.

Another question of direct economic interest is the possibility of utilising the linseed straw in Western Canada, which though essentially it is the same plant as fibre flax, has so far been found useless, and is mostly burnt. Any use that could be established for this by-product which would increase even to a moderate extent the total money yield of the crop to the farmer, would be a very important factor in extending the cultivation of flax for seed purposes throughout larger areas in Canada.

AFRICA.

The evidence taken goes to show that in the higher portions of British East Africa the conditions of climate and soil are entirely suitable to the growing

of flax, which has already been carried on upon an experimental scale for several years. It was stated in evidence that 5,000 acres were put under flax in 1918, that this would probably be greatly expanded in 1919, and it is estimated that the area might be increased to 100,000 acres in ten years. The labour supply appears to present comparatively little difficulty, the natives having shown an unexpected capacity to acquire the necessary skill in working the scutching machinery, and the industry seems to be established on a safe basis. The Committee, therefore, addressed to the Colonial Office, through the President of the Board of Trade, a strong recommendation that every possible assistance should be given to secure the speedy extension of the industry. The Committee felt in particular that there is need of expert assistance in British East Africa in the preparation of flax for the market. It is essential, for the success of the industry in the Protectorate, that its flax should be thoroughly reliable, and that its marks should be recognised in the markets. To secure this it is necessary not only that the flax should be properly handled after it has been pulled, but that the fibre should be properly graded.

A scheme has been laid before the Committee for the extension of flax production by means of settlements of disabled soldiers in British East Africa. The scheme was forwarded to the President of the Board of Trade for transmission to the proper authorities, with the Committee's recommendation and approval, so far as flax production is concerned.

In other parts of Africa, *e.g.*, Egypt, Nyasaland, Rhodesia, and South Africa, the industry seems to present possibilities of success, though it has not yet passed the experimental stage, but the Committee have not yet gone fully into the situation in these countries.

AUSTRALASIA.

With regard to Australia also, the Committee has received certain information which points to the conclusion that flax can be grown successfully there on a large scale if the economic conditions of the crop are likely to offer sufficient inducement, but so far it has only had the evidence of one witness on the subject, and until this has been supplemented by further information it prefers to defer any references to the matter. The same applies to New Zealand.

INDIA.

With regard to India, the Committee has heard evidence regarding experiments in flax growing which were made some years ago in Bihar, and has received reports of experimental work carried on in other parts of India. The results show that flax can be successfully grown. Here, as elsewhere, there is little

doubt that the system of central retting would be necessary to obtain the best results. This, however, necessitates skilled labour and supervision. Unquestionably the successful development of the industry would also depend upon the services of an expert who would supervise the handling of the crop after it has been gathered and its proper preparation and grading for the market.

DEVELOPMENT IN THE EMPIRE.

To sum up, the position with regard to the future development of these flax fields with the British Empire may be put as follows:—

In all of them it has been demonstrated that flax can be successfully grown, and the question is simply whether, in view of the economic conditions of the crop, it is likely to be a success, not merely under the present abnormal conditions created by the war, but under whatever conditions may finally be established as normal after the war. It is very probable that, at least in certain cases, the possibilities of these areas may be so clearly demonstrated, and the industry so firmly established while flax is still at or near its present abnormal level of prices, that these new areas will be able to carry on the production of flax on a large scale under whatever conditions may arise later on, and so provide the Empire with a permanent supply of the raw material within its own bounds.

RECOMMENDATIONS.

The Committee make the following recommendations:—

1. It is undesirable that an industry so important as the British Linen Trade should remain largely dependent upon external sources of supply for its raw material, especially as the industry has proved to be indispensable in war time,

2. The efforts made by the Government under the necessity of abnormal war conditions to foster the revival of flax growing in the United Kingdom and to extend its cultivation within the Empire have achieved a considerable measure of success, and it is essential that these efforts should be continued until full value has been derived from them.

GREAT BRITAIN.

3. (a) The efforts made under the stress of war conditions to revive flax growing in England and Scotland have been essentially experimental in their character, the main point being to determine whether under modern conditions, including the use of machinery and the central retting process, it is possible to re-establish the industry on a large scale and on a sound economic basis. In Great Britain it is desirable that this work should be continued until sufficient data are accumulated to provide a definite answer to this question.

3. (b) In the event of the result of these experiments being unfavourable to the continuance of the English and Scottish schemes on an economic basis the question will still remain whether part of the area and of the establishment should be retained for further experimental purposes on the lines of purely scientific research.

3. (c) Research should be undertaken into the possibilities of further mechanical improvements in the means of cultivating and handling flax.

IRELAND.

4. (a) The Department of Agriculture and Technical Instruction should at once take steps to develop and extend their existing schemes for the encouragement of flax growing in Ireland, and for this purpose they should be provided with funds to enable them:—

- (1) To provide further instruction in the cultivation and handling of the crop, and to devote special attention to the new districts where instruction is most needed.
- (2) To continue and extend their investigations into the selection, improvement and supply of the varieties of seed best suited to Irish conditions, and other questions affecting the growing of flax in Ireland.
- (3) To make permanent provision for the training of instructors and scutchers.
- (4) To give loans for the erection of new, and for the repair and extension of existing, scutchmills.

NORTH OF IRELAND.

4. (b) The work of the Flax Society may also be regarded as mainly an experiment directed to the same problem as that of the English and Scottish schemes, and should in the same way be continued for such time as is necessary to secure its full experimental value.

SOUTH OF IRELAND.

4. (c) It is of the first importance that an experiment should be made on a sufficiently large scale to test the feasibility of reviving the flax-growing industry in the South of Ireland on factory lines, and for this purpose at least two units of the area of 1,000 acres each should be established in the South, as already recommended by the Committee.

CANADA.

5. The scheme for the supply of fibre seed from Western Canada should be continued until such a time as, owing to the return of normal conditions or the development of other sources of supply, the question of seed supply for the United Kingdom is put on a permanently satisfactory basis.

BRITISH EAST AFRICA.

6. (a) The results already achieved in British East Africa warrant the hope that success in this area is likely to be permanent. That nothing may be lacking on the part of the authorities to ensure this success, we recommend:—

- (1) The provision at central points of machinery for the treatment of flax;
- (2) The development of agricultural research and experiment in flax production in the Protectorate by such means as after suitable investigation the local Department of Agriculture may suggest; and
- (3) The provision of expert assistance in the preparation and grading of flax for the market.

6. (b) The scheme for the settlement of slightly disabled soldiers in British East Africa should be adopted, and if successful should be made the first of other schemes for the settling of soldiers in this colony, where the conditions seem to be peculiarly favourable to the production of flax.

VERNACULAR EDUCATION IN CEYLON.

Reasons for Success.

In concluding a bulletin issued by the Bureau of Education, India, entitled "Notes on Vernacular Education, in Ceylon," Mr. H. Sharp, C.I.E., Educational Commissioner with the Government of India (who recently visited Ceylon) writes as follows:—

It has already been pointed out that the percentage to the population of those who attend school in Ceylon is just three times what is in India. The percentage of literacy for males is 40·4 and for females 10·6 against 10·6 and 1·0, respectively in India. The visitor who is acquainted with Indian village conditions will be impressed in Ceylon by the wholesale way in which things are done, and also by the excellence of the education imparted. He will be thinking of the small, dark building, stuffy in summer and sunless in winter, with its fifty pupils mainly crowded together in the infant classes, which so often represents the educational centre of an Indian village; and he will contrast it with these open school rooms, spacious and airy, with anything from 100 to 1,000 pupils divided into well-proportioned classes, each with its teacher and monitor. The

school in Ceylon is alive and things go with a business-like energy which is too frequently lacking among the stagnant lower-classes which overload Indian institutions. There are reasons for this contrast; and when we consider them, it is only fair to bear in mind that India too can show many admirable elementary schools—indeed, whole tracts where such schools abound. The contrast is between the average institutions found in the two countries.

WEALTH OF THE ISLAND.

The natural wealth of the Island is a potent factor among these causes. It permits of a reasonable expenditure upon education and of the retention of the children at school beyond the age when they become useful for agricultural or other work. The ancient stories of this "land of the ruby and the hyacinth" are no myth and are as true now as in the days of the Greek writers. Tea, rubber, plumbago, cocoa, the arecanut, cinnamon and above all, the cocoanut and its products, to say nothing of precious stones, constitute an unfailing mine of riches. Here the cultivator is, indeed, blessed: the earth pours out for him an easy livelihood and a few acres of cocoanut palms bring him a solid monthly income.¹ There is no income-tax, no land revenue. Indeed, the only form of direct taxation is a poll-tax, of Rs. 5'0 a year on all males between 18 and 55 years of age. The revenue is derived from customs, the railway and other such sources. The annual value of exports is £3'6 per head of the population against £0'53 in India. The revenue is £1'1 per head against £0'37 in India.

Thus Ceylon is in a position to afford a good educational system. The expenditure on education from public funds per head of the population is more than double that in India. And yet this result is accomplished by the allotment to education of a smaller percentage of the public revenue Ceylon spends 3'5 per cent of her public revenue on education. India spends 4'3.

Then again there is the Ordinance which it is easy to enforce with reasonable strictness because of the abundance of educational facilities and the general desire on the part of the people for instruction. The wealth of the island and the advanced state of civilisation to which most of its inhabitants have arrived rendered education popular. Caste and

¹I was informed that an acre of cocoanut gives R 0 a month, i.e., from the mere sale of the produce. Others told me that this was only in the richer parts of the Island, but admitted that return was large even elsewhere. Such calculations made no reckoning of the further return from the manufacture of oil coir and copra, with which the cultivation has nothing to do.

"purda" are of minor importance, Sinhalese girls come readily to school. This fact radically affects the attitude of the people towards education; the literate mother regards literacy as the rightful heritage of her offspring. The only extensive area in India which can compare in the matter of education with Ceylon is Burma, which also is mainly a Buddhist country. In Burma 37'6 per cent of the male population and 6'1 of the female are literate.

WESTERNISING INFLUENCES.

Westernising influences have been strong in the Island, and, without breaking down the national characteristic, have left their marks in many ways upon the life of the people. The missionary element is potent and adds considerably to the educational assets of the Island. The European element in the population is substantial and (including Burghers and Eurasians) amounts to 9 per cent. No less than 0'8 per cent of the population are enrolled in English schools. The number of males literate in English in 1911 was three and a half times the corresponding figure in India and the number of female was twelve times. In some of its aspects Ceylon appears to have parted from the habits of the immemorial East and to have adopted European ways and requirements.

Again, vernacular education in Ceylon is worth having, not only because the people feel the need of it, but also because it is good. The teachers are reasonably paid. Training, though by no means universal, is thorough. The head-master is alert and takes pride in his school. Control is effective. Much of the education is imported in government schools, which are sufficiently numerous to set a high standard. Inspection is adequate. For a population which is not larger than that of some Indian districts there are a Director of Education and an Assistant Director; there are three Inspectors, one Inspectress, an Inspectress of drawing and an Inspectress of needle work—all Europeans, who tour throughout the Island; there are five Inspectors of English schools, with territorial jurisdiction; and there are thirty sub-Inspectors. An Indian district has on the average one-third of the services of a single Inspector, one-third of these of an assistant Inspector, one deputy Inspector and half the services of a similar officer, and four sub-Inspectors or officers of like grade. For a district containing four millions of people, the allowance of inspecting officers would ordinarily be larger than this—possibly three times as large. But, even so, the contrast is remarkable.

Such, so far as I could ascertain, are the reasons which render compulsory education a fairly easy problem in Ceylon and which keep the instruction at a high level. The natural advantages of the country are its own and cannot be artificially reproduced elsewhere. But perhaps these few notes may be found to contain some suggestions not altogether inapplicable to India.

ECONOMIC NOTES.

EDUCATION.

Weaving Schools in the Bengal Presidency.

In the Bengal Legislative Council, some time ago the Hon'ble Mr. O'Malley sketched briefly the existing organization for instruction in up-to-date methods of weaving, and stated what action Government propose to take in order to give further instruction and to help to resuscitate the industry. The Hon'ble Member said :—

"We have already at Serampore the Government Weaving Institute where instruction is given to two distinct classes, the first consisting of young men of good education who are likely to qualify as teachers, overseers, managers—in fact, young men who are likely to be organizers of the industry. The second class consists of those who are themselves weavers and their sons. The institute also serves as a centre from which instruction is given to weavers through schools of weaving which have been established in different centres of the industry. In Calcutta there are some weaving schools, their being two weaving schools at Cox's Bazaar and at Tangail. There is also one in Malda and one in Pabna in Northern Bengal, and one at Bankura in West Bengal. Not only do young men receive training in these weaving schools as well as at the Weaving Institute at Serampore, but Government help them to set up business when they pass through their course, and give them advances for the purchase of looms and other accessories. In spite of this it is recognised that the use of the fly-shuttle loom and the adoption of up-to-date methods of weaving have not spread as fast as could be desired. It seems that the introduction and spread of up-to-date looms and up-to-date methods through the villages cannot be given full effect to by means of weaving schools at fixed centres. A scheme has therefore been prepared for peripatetic instructors who will go about the villages, demonstrating the use of the fly-shuttle looms to the weavers themselves instructing them in preparing their yarn before the actual process of weaving is begun, and also assisting in creating weavers co-operative societies. It is hoped that these instructors will succeed in getting fly-shuttle looms adopted more rapidly than at present, and that they will help to create a greater demand for instruction in modern methods. If this

is the case, the attendance in weaving schools will rise, and the number of schools will have to be increased. One such peripatetic instructor has already been appointed in the Burdwan district, and there has already been a fair amount of success; a certain number of fly-shuttle looms have been bought by the weavers, and they are earning their livelihood. The Principal of the Serampore Weaving Institute is anxious to extend the system, and has proposed that four more peripatetic instructors should be attached to the weaving schools at Tangail, Malda, Bankura and Pabna, as the managing committees of all these schools are very anxious to have peripatetic instructors. Besides that, the Principal proposes that peripatetic instructors should be employed in districts in which no weaving schools are established. I think it will be recognised that this arrangement has a certain advantage, namely, that the villagers will be reached more easily than if there is a weaving school at a fixed centre. Again, in the districts in which we already have weaving schools, the work done by the schools will be brought home to the weavers, and I think the knowledge of the modern methods will be more easily disseminated in the way."

EDUCATION IN TRAVANCORE.

The following Proceedings of the Government of His Highness the Maharaja of Travancore have been issued :—

The Director of Public Instruction has forwarded, for the consideration of Government, certain proposals of the Deputy Director of Public Instruction relating to the revision of the curricula of studies in Vernacular Schools. The Deputy Director thinks that the curricula of studies now in force in these schools are defective in several respects and suggests that English and Sanskrit may be made compulsory subjects of study and that subjects of practical utility may be more largely and systematically taught than at present. The Deputy Director is also of opinion that, in view of the marked expansion and development of Vernacular education in recent years, a syllabus prepared on the most practical and up-to-date lines has become a desideratum and that the formation of a Committee for considering the whole question fully and arriving at a definite decision should not be postponed.

The Government of His Highness the Maharaja have carefully considered the proposals of the Deputy Director of Public Instruction and they generally agree with him in the view that the curricula of studies now in force in Vernacular Schools

call for thorough and immediate revision. The outstanding defect in the existing course in Vernacular Schools which was introduced with the Education Code in 1085 M. E. is that it is far too literary and that it overlooks the practical, vocational side. It is essential that this defect should be remedied, as far as possible, in the best interests of the pupils passing through the portals of Vernacular Schools. It is also necessary that attention should be paid to the physical culture of the pupils. Government propose to deal with Vernacular education for boys in the first instance. The proposals regarding the changes to be introduced in the curricula of studies in Girl's Schools have not yet been received from the Director of Public Instruction, and action will be taken in the matter after the receipt of these proposals. Vernacular education should aim at not only imparting general knowledge, but also teaching a profession or industry which would enable those who successfully pass through the course to earn their bread independently of public service. For formulating practical proposals regarding the revision of the course of studies in Vernacular Schools for Boys so as to suit modern conditions and to secure the maximum material benefit to the pupils attending these schools, and for considering such correlated subjects as the reclassification of schools, the qualification of teachers, and the number and nature of text-books to be introduced consequent on the revision of the course, His Highness' Government resolve to appoint a Committee consisting of Officials and Non-officials as below:

OFFICIAL MEMBERS.

- (1) Mr. P. Ramaswami Aiyer, B.A., Deputy Director of Public Instruction—Chairman.
- (2) Mr. I. C. Chacko, B.A., B.Sc., State Geologist.
- (3) Dr. N. Kunjen Pillai, M.A., B.Sc., Director of Agriculture and Fisheries.
- (4) Mr. S. Parameswara Aiyer, M.A., B.L., Acting Under Secretary to Government.
- (5) Mr. A. Gopala Menon, M.A., Assistant Professor of History, His Highness the Maharaja's College, Trivandrum.
- (6) Mr. A. Narayana Aiyer, B.A., L.T., Head-master, Higher Grade English School, Trivandrum—to be also Secretary.
- (7) Miss D. H. Watts, B.A., Lady Principal, His Highness the Maharaja's College for Girls, Trivandrum.

NON-OFFICIAL MEMBERS.

- (1) Mr. K. C. Mamman Mapillai, B.A., Editor, the Malayala Manorama, Alleppey.
- (2) Mr. N. Kumaran Asan, Adwaitasramam, Alwaye.

- (3) Mr. R. P. Kulandaswami Pillai, B.A., L.T., Head-master, St. Joseph's Higher Grade English School, Trivandrum.
- (4) Mr. C. Raman Tampi, B.A., B.L., High Court Vakil, Quilon.

The following details relating to the new Vernacular School Leaving Examination will also be referred to the Committee for report:—

- (1) What should be the subjects, compulsory and optional, for the proposed examination, and what should be the minimum number of marks in each subjects or group of subjects, as the case may be, for a pass;
- (2) whether any progress register should be maintained, and if so in what form; and
- (3) what should be the form of the certificate to be awarded to the successful candidates.

The Committee should hold their preliminary meeting in Trivandrum *at once* and settle their programme of work. The Victoria Jubilee Town Hall will be placed at their disposal for their meetings. A period of six months is allowed to the Committee for their deliberations, at the end of which they should forward their report to the Director of Public Instruction, who will forward the same to Government with his own remarks thereon. The Non-official Members of the Committee will be given mileage at the rate of (14) fourteen chackrams and daily allowance at the rate of Rs. (5) five for all journeys that may be undertaken by them in their capacity as members of the Committee. The official Members including the Chairman will be paid the usual rates of travelling allowance for which they are eligible under the Service Regulations.

REVISION OF EXPENDITURE.

The subjoined statement shows the gross outlay, the receipts, and the net expenditure under education during the ten years ending with 1093 M.E.

Year.	Gross expenditure.	Receipts.	Net expenditure.
Rs.	Rs.	Rs.	Rs.
1084	7,41,764	1,73,729	5,79,606
1085	7,60,364	1,71,410	5,88,954
1086	7,95,713	1,72,584	6,23,129
1087	9,55,951	2,06,131	7,49,820
1088	12,84,450	2,56,581	10,27,869
1089	15,89,080	3,06,503	12,82,577
1090	18,53,540	3,86,921	14,66,619
1091	20,03,352	4,34,113	15,69,239
1092	20,65,254	4,86,721	15,78,533
1093	22,21,674	5,65,343	16,56,331

The gross expenditure rose from Rs. 7.41 lacs in 1914 to Rs. 22.21 lacs in 1919, or by 200 per cent nearly during the decennium under review. The exact figures for 1919 are not yet available. But the revised estimate is Rs. 23.39 lacs, against a budget grant of Rs. 23.91 lacs while the expenditure estimated for 1919 M. E. is Rs. 26 lacs. It is evident from the foregoing figures that the growth of expenditure under 'education' has been rapid and substantial. The total expenditure is now about 15 per cent of the total revenue of the State. This expenditure does not include the outlay on the construction and maintenance of educational buildings, which is being charged to the P. W. D. Though, under receipts, there has been no substantial increase during the period, yet it covers not more than 25.5 per cent of the gross expenditure, and the direct receipts from education are hardly capable of much further expansion. Notwithstanding the large outlay on education year after year in all its branches, the demand for more schools, for higher classes in existing schools, and for a larger number of teachers has still to be met. Again funds have to be found for the improvement of the material condition of the teachers in Vernacular Schools, for the development of technical and industrial education, for the expansion of female education and the education of particular classes, and for a variety of other important matters which are bound to come up for solution with the new angle of vision in regard to educational ideals. At the same time, it has to be recognised that it will not be possible to add indefinitely to the budget grant already sanctioned for education from the general revenues without seriously handicapping the other departments of the State. His Highness' Government therefore consider that the time has now arrived for reviewing the expenditure under education and for devising measures, which without adding substantially to the existing grants from the State Revenue, will set free funds for educational development on modern lines. To consider this question, Government resolve to appoint a Committee as below :—

OFFICIAL MEMBERS.

- Mr. K. George, Financial Secretary to Government. (Convener),
 Mr. J. Pryde, Inspector of English Schools.
 Mr. P. Ramaswamy Aiyer, Deputy Director of Public Instruction.
 Miss. E. C. Carrapiett, Inspectress of Girl's Schools.
 Mr. N. Krishnaswami Aiyer, S.P.T., Professor of Chemistry, His Highness the Maharaja's College.

NON-OFFICIAL MEMBERS.

- The Ven'ble Archdeacon J. J. B. Palmer, Kottayam.
 Mr. T. Kumara Pillai, Member, S. M. P. A., Kalkulam.
 Mr. P. K. Kesava Pillai, B.A., B.L., High Court Vakil, Trivandrum.
 Mr. C. P. Thomas, B.A., L.T., Head-master, M. T. Seminary, Kottayam.

The Committee will report on the following specific points :—

- (a) whether, and if so, how the expenditure now incurred under education could be revised with a view to eliminate all avoidable expenditure ;
- (b) whether it is not feasible and necessary to invest local bodies with the entire responsibility for Lower Grade Vernacular Education with a contribution from State funds ; and, if so, how this should be done and what grant should be made from Government, it being clearly understood that inspectional control will rest with the Department ; and
- (c) whether, and if so, what changes should be made in the present system of grant-in-aid to private schools.

The report of the Committee should be in the hands of Government before the close of Makaram 1919. The report should be forwarded through the Director of Public Instruction who will submit it to Government with his own remarks. The Committee will meet in the office of the Financial Secretary to Government. The Non-official Members of the Committee will be paid mileage at chuckrams (14) fourteen & daily allowance at Rs. (5) five for all journeys undertaken by them in their capacity as members of the Committee. The Official Members will be paid usual rates of travelling allowance for which they are eligible under the Travancore Service Regulations.

AGRICULTURE.

Cocoanut Industry in Malaya and its future prospects.

According to the report of the Standing Committee of the Planters' Association of Malaya, presented at the twelfth annual general meeting on April 30th, the area under cocoanuts on estates of over 100 acres was given at the end of 1917 as being over 100,000 acres for the whole of Malaya. The area in smaller holdings is uncertain, but may be approximated at from 100,000 to 125,000 acres, giving a total of from 200,000 to 225,000 acres at the end of 1917.

In the absence of definite figures we may record the opinion that the amount of new plantings is small, and would, perhaps, about balance the areas of unprofitable cocoanuts that have been cut out, or abandoned during the year. The acreage at the end of 1918, therefore, may be taken as being about what it was at the end of 1917, with the remark that most of the new planting has been done on land shown by experience to be suitable to the profitable cultivation of cocoanuts; whereas most of the reduction of area has been where the cocoanuts were under unsuitable conditions.

The price of copra during the year ruled from \$ 6 to \$ 11 per picul, compared with \$ 4.50 to \$ 8.50 last year. Prices improved steadily throughout the year, and the prospect is that higher prices will be maintained during 1919.

Cocoanut growing with the production of copra as its end point, runs on a very narrow margin of profit per acre; and this fact, together with the difficulty of establishing a plantation, and its high cost of upkeep, have tended to check rapid extensions of the industry.

However, in view of the shortage of edible oils throughout the world, and the suitability of cocoanut oil for edible purposes, there is a strong probability that the cocoanut plantations will find it profitable to discontinue the sale of copra for export, and either co-operatively or otherwise, produce and export, cocoanut oil of an edible grade. In fact, some progress has been made towards this end.

An object lesson in cocoanut development in the Philippines has attracted considerable attention locally. In 1912, the Philippines exported 169,000 metric tons of copra, and almost no cocoanut oil.

In 1912, modern oil mills were established. In 1913, the export of cocoanut oil came to 1,300 metric tons, By 1916 it was 16,000 metric tons; and in 1918, over 100,000, metric tons of cocoanut oil were shipped. The value of 100,000 tons of cocoanut oil is £ 6,000,000.

INDUSTRIES AND COMMERCE.

A New Hydro-electric Plant in Burma.

The following particulars of a new hydro-electric plant installed at the Kaubauk Mine in Burma appeared in *Capital* of Calcutta.

It is the first of its kind to be erected in the district, and the opening ceremony marked the completion of an important step in making use of Burma's natural resources. Kaubauk is distant about sixty miles from Tavoy town, and from the point of view of the company owning the mine the scheme is important because it provides them with power which renders possible the successful and profitable exploitation of the alluvial deposits that exist in the Tavoy district. But it has a wider importance than the purely local aspect, as it furnishes to the wolfram industry in particular, and to the province in general, an incentive to make use of the natural resources so abundantly granted to Burma. About three miles to the southward of the town of Kaubauk, and on the top of the hills which rise to a height of 3,000 feet, is a natural horse-shoe shaped valley, and across the heel of it has been built a stone dam, resting on a solid granite foundation, which impounds a reservoir which stores five hundred millions of gallons of water. The greatest care has been bestowed upon the construction of this dam. On the face of the dam is an apron of reinforced concrete, fourteen inches thick at the base, reduced to eight inches at the top. The by-wash of the water flows over a ledge of solid granite cut into the side of the hill at the eastern extremity of the dam. About three miles of pipe convey the water to the power-house, built on the edge of the mine at Kaubauk, and the last portion of this pipe drops nearly perpendicularly some eighteen hundred feet. The available energy of this pipe of water is 1,000 brake horse-power, but for the dynamo so far installed only half this power is being utilized. The head of water at the power-house is 2,094 feet, a height only excelled in a few plants in Switzerland and the United States of

America. The electric energy now being made operates the machinery on a pump dredge and uses up 400 horse-power. On the dredge is a motor-pump operating a monitor which breaks down and sluices the ground containing the alluvial deposits of ore, whilst the electrically-driven gravel pump elevates the broken ground to the sluice-boxes in which the ores are separated, leaving the tailings to be washed away and heaped up behind the dredge. The capacity of the dredge is 30,000 cubic yards per month. Part of the balance of the electric power is used in driving the ten stamp battery which crushes the ore obtained from the reefs in the hills.

EMPIRE SUGAR PRODUCTION.

In the Preliminary Report of the Empire Sugar Supply (Technical) Committee, submitted by Mr. Arthur R. Ling on July 16, at the annual meeting of the Society of Chemical Industry, over which Lord Denbigh presided, there are some interesting facts given regarding sugar production in India and the Near East.

Of India the report states that it was at one time the largest producer of sugar of any country in the world, but so far as statistics show at the present time it occupies a second place in the list, Cuba coming first. However, it must not be forgotten that statistics in British India are by no means complete, whilst those of the Indian states are still less so; consequently, much of the sugar which is produced and consumed by the Indians is unrecorded. The area under sugar-cane and sugar-yielding palms for the season 1916-1917 was estimated to be as follows:—Sugar-cane, 2,437,000 acres; palms, 175,000 acres. The cane was estimated to produce 2,626,000 tons of gur, and the palms 400,000 tons of gur, a yield of 0.92 tons and 2.28 tons per acre, respectively. These figures have, however, little significance, for the present. Small holdings will have to be converted into centralised estates if any real improvements are to be effected in India as regards increasing the yield and quality of the sugar. With regard to the future development of sugar cultivation in Ceylon, it may be said that fully two-thirds of the island receives less than 75 inches of rain per annum, and the cultivation could only be carried out in the dry area with irrigation, especially when it is remembered that the greater

part of the rainfall falls within the months of the north-east monsoon season. Of Cyprus the report states that up to the middle of the sixteenth century it was one of the principal producers in the Levant of cane sugar, but no attempt has been made in recent years to revive the industry. It is believed, however, that beet could be successfully grown in the island, and within the last year or so inquiries have been made from two different sources as to whether the Government could grant monopolies for the manufacture in the island of sugar (a) from beet, and (b) the carob bean. In regard to Egypt, there is no suitable land available for the extension of the sugar industry, but, should the remaining basins of Upper Egypt be converted to perennial irrigation, a considerable area will be available. From the Sudan no information has been received, but it appears that, with irrigation, there should be a possibility of establishing a sugar industry.

MANUFACTURE OF PAPER FROM BAMBOO IN TRINIDAD.

We take the following from the *Society of Arts Journal*:—

An important project for manufacturing paper from bamboo in Trinidad is being carried out by an Edinburgh firm of publishers. About 1,000 acres of land near St. Joseph (seven miles from the Capital at Port of Spain) have been planted in bamboo, and a concession has been obtained giving the firm the right to cut bamboo from the Government forests.

According to report by the United States Consul in Trinidad, the firm in question, foreseeing a paper famine throughout the world within the next few years, have been giving serious consideration to the problem of providing adequate paper reserves for themselves for the future; and although realizing that paper can be produced from any vegetable material containing cellulose, nevertheless came to the conclusion that bamboo was most suitable for the purpose. They selected Trinidad for their bamboo paper project, as the bamboo grows there very quickly, having sufficient development within three or four years for making paper.

Experts have been employed to study the question of easily getting rid of the knots in the bamboo, and also of the yellowish-green colour that has hitherto been considered a drawback for the manufacture of

paper from bamboo. The first experiments in Trinidad with the bamboo consisted of putting the reeds through sugar-cane presses. While this rather crudely accomplished the purpose, nevertheless, it was found to be desirable that the bamboo should be shredded as well as mashed, and the knots removed. It is said that a machine has been designed which accomplishes all this work, and that a bleach or a dye has been discovered which makes the pulp wood and paper perfectly white. It is understood that the machinery for the bamboo plant, to cost about £30,000, has been ordered from the United States.

INDIAN INSTITUTE OF SCIENCE.

Past Year's Industrial Researches.

The tenth annual report, that for 1918-19, of the Institute of Science, Bangalore, just issued, is an interesting record of researches made for industrial purposes.

As regards investigations made in the institute, in the department of general and organic chemistry, Mr. M. N. Mehta, M. A., B. Sc., a graduate of the Bombay University, was engaged, with the help and under the guidance of Dr. Sudborough, in an investigation into the deterioration of paper. This question has been taken up at the request of the Government of India. An examination of certain perished books has been made and proves that paper made from rags does deteriorate, although this has been denied by certain cellulose experts. The question is one of vital importance to India as it is found that paper in many books dating from 1820 show distinct indication of perishing. Many other important investigations were carried out by the department, the subjects including essential oils, wood distillation, the manufacture of glycerine, and experiments for the production of white lead and for the extraction of caffeine. In the department of applied chemistry under Dr. Gilbert J. Fowler, researches were made regarding the Mahua industry, indigenous dyes and varnishes. Considerable progress has been made in conjunction with a Bombay firm in the preparation of a detailed scheme for the production of gelatine on a manufacturing scale. The purification of water was another subject which engaged Dr. Fowler's attention. Brief results of his observations in Shanghai and Hankow, where he was invited last year to advise the municipalities on urged problems connected with the water-supply and sewage, are recorded in the appendix to the report.

Among other things an important series of tests of Indian timbers for the Indian Munitions Board for aircraft purposes have been carried out by Mr. Khan.

MOTOR INDUSTRY IN INDIA.

A fine opportunity would seem to be open now for the development of an Indian motor industry. How during the war the motor trade in India has been captured by the United States of America will be seen from the following statement and figures, culled from the latest 'Review of the Trade of India':—

"Ninety-five per cent of the total number imported came from the United States as against 37 per cent in the previous year. The interesting feature was the considerable decrease in the number of cars imported from the United Kingdom. Only 39 cars came from England, as against 449 in the previous year and 1,669 in the pre-war year 1913-14. The year was certainly, like its two predecessors, the year of the American motor cars in India."

Referring to this complete capture of the Indian motor trade by United States, *Business* says:—

"Unless something unforeseen happens, it is difficult to see how the supremacy of America in the motor trade of the world can be seriously challenged. There are only two possible ways of challenging her. Either we must beat her at her own game, and produce standardised machinery superior to hers, or we must find cheap labour. In England the only hope lies in standardisation. Why should not India try to utilise her cheap labour? The present Industrial situation in Europe seems to point the opening to India. Her labour, if properly employed, and assisted by a really sound capital outlay, such as that of the Tata works, seems to offer us the only possibility of retaining that industrial supremacy which the Empire requires. I should advise anyone to put money into a sound motor industry started in India, and I feel certain that some of the readers of *Business*, who have money to spare, would be amply rewarded by starting such a venture. If they combined standardisation with Indian labour, they should be able to produce an article which would capture the markets not only of the East but of the West.

JAPANESE PAPER YARN.

A Reviving Industry.

A Correspondent writes to the "Times Trade Supplement":—

At the moment paper yarn is probably of most interest from the point of view of its employment in the weaving of certain kinds of fabrics, mainly those used for making bags and packing cloth, until supplies of raw cotton and jute are increased to a quantity more nearly adequate to the world's demands.

In Japan paper cloth is no new thing, but during the war its manufacture, from paper yarn or from raw fibres used in paper making, has shown a progressive tendency. Formerly a kind of paper cloth was made and used in Japan as a substitute for cotton and silk fabrics for clothing. The paper yarn which has been made in Europe during the war, mostly in Germany and Austria, is made chiefly from chemical wood pulp, but Japanese paper yarn is made from a much tougher paper in the manufacture of which the inner fibrous bark of the paper mulberry and other trees having a fibrous bark is used. In a fabric known as Shi-fu the warp consists of silk and the weft of paper yarn. Fifty years ago Shifu fabric was very popular in Japan for women's summer clothing. Later, when the finer and more durable cotton fabrics began to be imported in large quantities and at low prices, the industry declined.

From the oldest times the fibrous bark of the paper mulberry (*Broussonetia papyrifera*) the gampi (*wickstrawmia* sp.), and *Edgeworthia papyrifera* have been used in making Japanese paper, and the fibres of these three plants are the strongest known for the purpose. Gampi cloth is well-known in Japan.

In the manufacture of paper yarn in Japan the paper manufactured from the fibres of *Edgeworthia papyrifera*, being fine, elastic, and of glossy appearance, is chiefly used. In external appearance Japanese paper yarn resembles linen yarn rather than cotton. Its most important uses are for weaving the cloth used for wrapping wool, silk yarns, and similar goods, and as the woof of material for belting, neckties, etc.

If the shortage of raw cotton continues, an increase in the Japanese production of paper cloth may help the situation to a slight extent.

PUBLIC HEALTH AND SANITATION.

Fleas and Scarlet Fever.

Dr. Hamer, the School Medical Officer for London, has, during many years, compiled comparative statistics of the relationship in the Metropolis of scarlet fever prevalence and flea prevalence. This year he returns to the subject in his annual report, and affords some very striking tables covering the past nine years.

The flea prevalence was estimated from the number of children found to be flea-bitten and from the number of beds in the common lodging-houses found to be flea-marked. The year 1910 showed a small augmentation of flea prevalence and also a small increase in the scarlet fever cases. In 1911 both fleas and fever were in abeyance. Again there was a small increase in both in 1912, this being confined to children aged only five years. Then the fleas began to increase markedly, and 1913, 1914 and 1915 were big "flea years." They were also big scarlet fever years. After that, in 1917 and 1918, the fleas fell away, and so also did the fever. The theory is attractive therefore. But objections have been brought against it. It has been pointed out, for example, that scarlet fever is by no means confined to dirty houses or dirty people. It has even been described as a disease of the well-to-do. This argument Dr. Hamer meets to some extent. He points out that so far as very young children are concerned scarlet fever is much more prevalent among the very poor. In older children its prevalence is about even between poor and well-to-do; in children over school age it seems to affect the better class more frequently, possibly, as is suggested, because the poor are by this time immune to the disease. The conclusion is drawn that "the facts as set out do not in any way conflict with acceptance of a flea hypothesis of spread of scarlet fever, provided it is borne in mind that there is undoubted evidence to show that in the poorer areas the disease tends to attack children at a younger age than in the well-to-do areas, and thus renders the poorer children at the higher ages immune from attack."

INDUSTRIAL MEDICINE.

American Advances in a New Science.

The Medical Correspondent of the *Times* writes:—

There is a movement on foot to urge the General Medical Council to authorize the granting of a Diploma for Industrial Medicine. A similar demand was made on a former occasion, but was refused on the ground that the subject was not then sufficiently developed. The experience of the last few years, however, have materially changed the situation.

The movement comes not a day too soon. On every hand interest in industrial medicine is being quickened. Employers of labour who are alive to the new necessities of their world have followed the experiments conducted by the Ministry of Munitions on questions of fatigue, over-time, early hours and so on with close attention. They have evinced a desire to obtain further information and in some cases have tried to secure the services of specially trained doctors. Unhappily there are not yet many medical men who have studied the subject closely, and so it would seem as if the demand in this instance exceeds the supply.

Meanwhile, the Americans have begun to devote very close attention to the subject. Messrs. Macmillan have just published the first number of a new journal, *The Journal of Industrial Hygiene*, under the joint editorship of Dr. David L. Edsall, U. S. A., and Dr. Stanley Kent, Great Britain, whose work on "Industrial Fatigue" is so well known. The journal has grown out of the recent establishment of teaching and research in industrial hygiene in the Harvard Medical School. The publishers propose to cover a wide field and to afford abstracts of the evergrowing literature on the subject.

In the present issue there is a very interesting article entitled "Telephone Operating, a Study of its Medical Aspects" by Dr. Anna Richardson, physician of the New England Telephone and Telegraph Company. This article shows with how great care telephone operators are selected by the company, and how well the care is repaid in efficient service; for example:—

"Very careful studies have been made by skilled engineers, watching conditions in an exchange, and listening in on positions, to note every possible variation in an individual's work in order to determine what proportion of time an operator can work well, *i. e.*, render the best service to the public with the fewest possible errors and with the least possible physical and nervous strain. In this way standards have been established which are technically called 'loads.' These vary for different types of operators."

There can be little doubt that the steps referred to above to secure efficient teaching of industrial hygiene in this country will be successful, and that at no distant period doctors so trained will have become the friends and advisers both of employers and of employed. Experiments already carried out have proved that between master and men, so far as health and hours of work are concerned, there is, within reasonable limits, one difference of interest; what is good for the one is good also for the other. This is a very important fact, and should have its bearing on the problem of industrial unrest.

BOOKS IN BRIEF.

Indian Constitutional Reform. By V. A. Smith, C. I. E., M. A., Hon. Lit. D., I. C. S. (Rtd.)
Published by the Oxford University Press.
Price 3s. 6d. net.

The danger of historians turning politicians is too well known to need special mention. The late Mr. Lecky did not prove much of a success in the House of Commons—he lost much by his connection with it, honorable though it was to that far famed body. Mr. Smith's essay into politics is neither a happy nor propitious one. He is frankly against the fundamental idea on which the new Reform Bill relating to India is based. We do not say this in a complaining mood; for every man has a right to his views. But when a man like Mr. Smith wants to expound his as a historian of India—his love for India stands unquestioned and he makes a point of it in the preface to his book—we expect him to be at least reasonable in the matter of interpretation. We should not be considered to be too critical. We shall give only one example. Mr. Smith—who has interpreted many an inscription or other historical document—wants us to interpret the word "responsible" in the famous declaration of August 20, 1917, "in the sense of being sensitive to Indian public opinion." We will not stop to comment on this interpretation, for comment on it is needless. Mr. Smith lacks imagination, and whatever his merits as a historian may be, he certainly is neither a statesman nor even a careful interpreter of documents. A scholar interprets a document not so as to read his own particular meaning into it but to bring out the meaning intended by the writer of the record. Mr. Smith says Sivaji was an autocrat and pleads that "the conditions are such that the Government of India must retain extensive 'autocratic' powers." Mr. Smith, like many an other critic, does not care to remember that much water has flown under the Ganges Bridge since the days of Sivaji. European critics will do well to remember that the Indians have not been left to evolve their own political ideas. The effect of the British connection should be given due weight. If this were done, much that is inexplicable in the present day demand of Indians would disappear. Mr. Smith himself, if he did that, would be more reasonable and less hesitant in meeting Indian demands. He would also understand why "educated Indian" has "very different ideas of Government." Mr. Smith's little book is a sad example of history not benefiting historians. We wish he had not yielded to the temptation of entering the stormy field of politics; so unfitted to a scholar of his type.

Rudiments of HandCraft. By W. A. S. Benson, M. A. Published by John Murray, London. 1 s. net.

This is a justly eloquent plea for handcraft in education. Mr. Benson quotes Professor Findlay's saying.—"The ideal primary teacher is one who, above all, is an artist and a craftsman." He refers also to Ruskin's more famous utterance in which he put forward the ideal of "liberal education founded upon right handcraft." If we are to approach this ideal, "we must lay that foundation in a course," as Mr. Benson puts it "of exercises contrived not only to develop sureness of eye and the touch of skilful hands, but also to stimulate intelligence by making clear the relation which drawings and written words, together with the principles of number and other rudiments of science, bear to the actions set for performance." Mr. Benson, after suggesting that the only material for the main course of such primary exercises is inevitably wood, adds:—

"Just as there is an art of arithmetic which is taught by itself independently of all the special forms of business, domestic or commercial, to which it may afterwards be applicable; so also, if we are to approach the ideal put forward by Ruskin of a "liberal education founded upon right handicraft," we must lay that foundation in a course of exercises contrived not only to develop sureness of eye and the touch of skilful hands, but also to stimulate intelligence by making clear the relation which drawings and written words, together with the principles of number and other rudiments of science, bear to the actions set for performance.

Now it happens that the only material we can use for the main course of such primary exercises is inevitably wood; but this does not, as people too readily assume, imply teaching carpentry or any one other of a score of trades which work in wood. What we have in view is one strand in the general scheme of education, to be woven in with the rest, usually between age limits of eight and twelve and considerably before the average time for specialised or technical training. And though perforce we handle in some shape the same stuff, our methods will be those of children, not of craftsmen; nor shall we follow the distinctive procedure of the joiner, the wheelwright, the cooper, or of any of the rest. For what we aim at is the intelligent control of certain muscular movements, which are the basis of practically all skilled craftsmanship, and at the same time are advantageous in the private life of all and sundry.

Deftly to handle saw and hammer and file and to appreciate the significance of line and rule and compass, taken with the reflex action upon the understanding, surely rank high among the heirlooms of civilisation;

and hereby lies a gateway to science and to art whether for profit of livelihood or enjoyment of life.

Although the decision to use wood as the prime material is easily arrived at, the precise form in which to obtain it is less obvious. For it must be such as can be procured easily and cheaply, and such as not to overtax the strength of young pupils. The nicely planted hardwoods sold to amateurs for fret-sawing are too costly, while to saw up a rough log or to plane a wide plank is too heavy a task for children. But all conditions are satisfied by the common sawn plasterers' lath, which can be worked with but a small collection of cheap tools upon simple substitutes for joiners' benches. Provision should also be made for cutting a few simple shapes from sheet tin, a material widely obtainable as a waste product; and it is for many reasons desirable to add painting, staining and polishing to our schooling. For these things like cookery, open a door to the chemical side of physics, just as construction does to mechanical science. Further, every exercise should result in a complete useful thing, made on intelligible purpose; or else be a piece of apparatus to illustrate mechanical theory as the lever, the inclined plane, the wheel and axel or the pendulum. How far the scientific trend is followed must depend upon the individuality of Teacher and Taught: at this early stage it matters little whether the artistic or the scientific aspect be emphasised for in such simple things rightness of adaptation of means to end is obvious from either point of view.

From the first pupils should be taught to work from drawings prepared or at all events traced in school. Instructions should as far as possible be given in writing because it is an invaluable discipline to follow this check upon slipshod reading and a test of understanding. Thus may a bridge be built between theory, that is, between book work and tangible visible fact."

The booklet is a most suggestive and a thoroughly practical one and we would like it to be placed in the hands of every teacher in this country. In Japan children are made to learn by the eye and the hand more than by the memory. Doing to things certain things rather than loading the memory ought to be the rule in primary education and for that better teachers are required. Until we get them, our primary schools will never be a success.

Owing to "Advertise!" is the title of a book first issued by E. Sampson, 7½ x 5½, vii+247 pp. Harrap. 5s. n. containing, as the *Times* says, the principles and practice of advertisement composition according to the latest and most approved American masters of the art. There are, it seems, Ten Commandments of advertising,

viz.—Be human, Be interesting, Be easy to understand, Be easy to read, Be humorous when you can, Be unusual, Be unexpected, Be tempting, Be subtle and Be positive. The author, on the whole, observes every one of them. Advertising, he says, "is a chain of ideas, carefully linked together, forcefully expressed, and scientifically calculated to produce a cumulative reaction upon a definite group of people"—an excellent definition were it not that it applies to quite a lot of things besides advertising. Rather better is the ingenious apologia for advertising:—"If you are feeling depressed, pick up a magazine or a newspaper and read the advertising. It will tell you how to cure everything from a backache to a heart-ache....It is a relief to turn from columns of war, murder, suicide and scandal to this good, healthy, resourceful advertising reading."

We would draw the attention of our readers to a pamphlet "**Notes on Forest Policy and Forest Management**" by Mr. F. A. Lodge, C.I.E., Inspector-General of Forests, Hyderabad. The book is published by the Bulletin Press, Secunderabad. Price 1 Rupee. It gives a Forest Officer's view on Forest Policy in very clear and simple language. Though Mr. Lodge is Inspector-General of Forests in Hyderabad, most of his experience was gained in Madras and the greater part of the pamphlet deals with questions which are of interest to the public in that Presidency.

Water Power in India. Preliminary report on the Water Power Resources in India, drawn up by Mr. J. W. Meares, M. I. C. E., Chief Engineer, Hydro-Electric Survey, has now been published by the Superintendent of Government Printing, Calcutta. It consists of seven chapters, illustrated with excellent plates and maps, and fourteen appendixes containing the information hitherto collected regarding the rivers and other possible sources of electric power in India and Burma.

The opening chapter contains a very clear exposition of the methods by which power can be developed from streams and reservoirs, and corrects the popular misconception that a natural waterfall, like that in the Cauvery or at Niagara, is necessary. The importance to India of combined schemes of irrigation and power is also clearly brought out. Further, on "Weather and Water," "Localities and Surveys," "Power and its Uses" are dealt with. Then follows a chapter on State control, Charges for water-power and Leases and agreements. Chapter 6 summarizes our present knowledge of the water-power already developed, under development and examined with a view to development. A general description is given

of the conditions in each province as an introduction to the "Lists of sites" in the appendixes. The final chapter puts forward a constructive programme for the further work of the survey in its various aspects, and calls attention to specially favourable sites for survey and perhaps development.

So far as the preliminary investigation has gone—and it is admittedly incomplete—India's industries now absorb a matter of over a million horse power, of which only some 285,000, is supplied by electricity from steam, oil or water. The water-power, so far actually in sight, amounts to 1½ million horse power, but this excludes practically all the great rivers at present uninvestigated. Thus, it is stated that the minimum flow of the seven great rivers eastward from the Indus are capable of giving no less than three million horse power for every thousand feet of their fall from the Himalayas, while similar considerations apply to rivers in other parts. Some doubt, however, is expressed as to the estimate of seven million horse power in the Irrawaddy and Chindwin rivers, given in the report of the Conjoint Board of Scientific Societies.

Although this report shows that the Cauvery scheme was the second, and not the first, in India, it was nevertheless the first to show the industrial possibilities of natural power with that which was then a very long transmission line, one of the longest in the world. The further possibilities on the Cauvery, at a Periyar Lake and in the Nilgiri Hills are emphasised. The latter district will, it is believed, very soon have a project in being. The first edition of 2,000 copies has been practically taken up for official use, and a second impression has already been ordered.

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EDUCATION FOR CITIZENSHIP.

BY RETA OLDHAM, M.A.,

*President of the Association of Head-
Mistresses.*

FOUR years ago few people could have been found to prophesy that one of the results of a war unexampled in scale, horror and destructiveness would be the quiet concession to women of a large first instalment of that parliamentary suffrage which they had so long vainly demanded. "Nothing happens but the unforeseen" say our witty neighbours and allies, and the manner, if not the fact, of this happening justifies the pithy saying.

Many of us women have now—more will soon have—the long coveted right which makes us full citizens of our country and Empire. Let us realise what this means. It means that six million women voters—nearly one-third of the total number of parliamentary voters in these Islands—will take part in the election of the next Parliament—that women if they do not fail to use their votes punctually and intelligently can have a very considerable share in determining the sort of Government we shall have in the future, the kind of measures which will be passed through Parliament, and therefore, to some extent, the sort of world

in which we shall all be living. Moreover, we may expect that extensions of the franchise will follow somewhat rapidly so that most of us now living may see the day when women will have realised the aim of the suffragist leaders and enjoy the parliamentary suffrage "on the same conditions on which it is, or may be, granted to men."

Now it is obvious that a great power is being committed to the hands of women and it is for them to show that they can exercise it worthily. It will not do for women to put their responsibilities upon others and to adopt without examination the views of either their male relatives and friends or of other women with more intellectual activity and more social zeal than themselves. Those who are satisfied to vote for other people's opinions, which they have not by enquiry and reflection made their own, are not discharging adequately their new trust. The first duty of a good citizen is to inform herself about her country—to learn about its past history and its present position. "Stands England where she did?" is a question we ought all to be qualified to answer, and we want to be assured that not only does she still stand for all that was best and noblest in her past but that she is moving forward in the front line of progress, hand in hand with the other great nations which, with her, are fighting the battle for human liberty.

The first essential for citizenship is education—we cannot serve if we do not know.

Education for citizenship begins as soon as a child is old enough to realise that she must not, in order to gratify herself, do what will hurt others. That is the first stirring of the feeling of "community" the "social" spirit—and a wise mother or teacher will steadily develop in the child the idea that she must refrain from doing what is contrary to, and do what will promote the good of the group of which she is a member—first the family, then the school, then the nation. Women have often in the past been accused of lack of this "community" feeling, and while it has been granted that they are very generally unselfish in their devotion to husband and children, they have been reproached with a want of that larger unselfishness which refuses to accept advantage, personal or family, at the cost of injury to the community. Food hoarding and food grabbing, for example, would have been rarer in recent times if the sense of citizenship had been stronger.

The next step in education for citizenship should be the awakening of a sense of responsibility. We are citizens of a great democratic state—that is of a state which has adopted the principle of Government of the people by the people for the people. It is we citizens and no others who are responsible for its good government, for its institutions good and bad, for the condition of the masses of its people, for the execution of its laws. It has no rulers that we, its citizens cannot, if we exert ourselves, both make and unmake, no institutions that we cannot mend or end, no laws that we cannot replace by others. These powers constitute a tremendous responsibility which we, if we are good citizens, must recognise and bear and for this we need above all education. We cannot judge a government until we understand the manner in which it is set up and the way in which it is administered. We cannot understand the value of an institution till we know the purpose which it is intended to serve and the measure in which it

fulfils that purpose. We cannot estimate our rulers fairly if we are too careless and indifferent to enquire into their qualifications and examine their record.

Now the best preparation for carrying out this great task of government which is laid upon each citizen of a democratic state is to learn to govern herself. Parents and schools alike have, I think, much to do in developing among their children the power of self-government. In the past schools have relied greatly upon rules and punishments for those who broke them. Too often both in the family and in the school it was thought unnecessary to explain the reason and the justification of the rules to those who were expected to obey them and the result has been too often resentment and disobedience. The willing obedience which often follows an appeal to reason and judgment had no chance to exist. There is no finer virtue than obedience but the self-respecting obedience of the free man is a far nobler thing than the cowed submission of the slave. Let us call the reason of our child into counsel; let us try to make them understand the nobility that lies in checking the lawless impulse, in laying down voluntarily for the common good a portion of our freedom, in following loyally the appointed leader. "It is a fine thing" says the writer who drew for us the 'Beloved Captain' "when men trust their leader and will follow him anywhere, but it is a still finer thing when they will stand by any leader whether they know him or not, and this last is the fruit of perfect discipline."

Then having learnt the lesson of self-discipline our young people may be trusted with a large share in their own government. A great deal of the license and lawlessness which we deplore in these days is a reaction against over-government. Our "citizens to be" to whom such powers will be committed, need our counsel and our guidance, but coercion should be as rare as is consistent with their safety, and, after reason is

developed, *blind* obedience should not be expected. Schools should be far bolder in trying experiments in self-government by their pupils and fertile in plans for rousing in them interest in everything that concerns the welfare of their village, town, county, and ultimately of their country and Empire. Associated with the work in schools should be visits to public institutions and to the meetings of public bodies where future citizens can learn something of the nature of civic duties and the qualifications required for their discharge. Debates and discussions on matters affecting the public welfare should be frequent. Citizens' Associations in every town and district might be made a most powerful means of awakening intelligent interest and supplying useful information in civic affairs. It should be the concern of all wise parents, as of all enlightened educators, to see to it that nothing which affects the good of the community should seem apart from, or uninteresting to those, in whose hands will lie, when they themselves have passed away, the government of that great and goodly Imperial heritage the establishment of which is both the highest achievement and the heaviest responsibility of our race.

Three were 44 mills on the list of the Japan Cotton Spinners Association in the month of June, 1919, having 3,185,000 spindles, and they produced 7,964,000 kwans of yarn of various counts, the average count being 2'4, consuming for the purpose 79,35,000 kwans of cotton and 130,000 of coal, and employing 31,400 male and 101,000 female work people. The actual horsepower used in manufacture was 65,560.

CO-OPERATION IN BOMBAY, 1917-18.

BY "RUSTICUS."

THERE is always so much of value to co-operators all over India in Mr. Ewbank's Report on the working of his Department in Bombay that even the fact that he has, in all probability, by this time submitted to his Local Government a Report for 1918-19 would not be sufficient justification for an omission on our part to review his Report for the previous year. It is difficult to fathom the reasons for the Bombay Government's attitude in this matter. If they are so overwhelmed with work that it is impossible for them to issue a review of the Report for some eight or nine months after it reaches them, they might at least allow it to be given to the general public in advance of their review.

Mr. Ewbank commences his Report with some interesting remarks on its arrangement. He mentions that, in previous years, he started by giving an account of the Provincial Bank and that, after dealing with central banks and unions, he came down, at last, to primary societies and treated supervision, audit and propaganda as entirely separate heads. As he says, this arrangement tended to throw the whole system into a false perspective and to magnify the functions of financing, controlling or supervising agencies at the expense of the village society. It must never be forgotten that the object for the benefit of which the whole fabric has been constructed is the village society and that the success of the movement can be gauged by no other criterion than the number of healthy, independent and successful primary societies it has created. Mr. Ewbank has, therefore, reversed the previous arrangement and, in the Report under review, places the working of the primary societies in the

forefront. That, as our readers may have noticed, has been our invariable practice in reviewing the progress of the co-operative movement in the different provinces.

1917-18 can only be regarded as a moderately good year in Bombay from a co-operative point of view. The *khariif* (monsoon) crops were poor in parts of North Gujarat and the Deccan and the cotton crop was much below the average in Khandesh. The prices of agricultural produce ruled very high but the congestion of traffic on the railways made it exceedingly difficult to move it. Plague was exceptionally severe all over the Presidency and brought the working of many co-operative societies to a standstill. Although wages rose substantially in the towns, the rise did not keep pace with the rapid increase in the cost of all necessities of life and the margin of earnings available for repaying loans to co-operative societies shrank. None the less, solid progress was made during the year. The number of societies increased from 1,307 to 1,650, the number of members from 130,903 to 156,805 and the working capital from Rs. 123.21 lakhs to Rs. 162.88 lakhs.

Of the 1,650 societies in Bombay, 1,319 are agricultural credit societies with unlimited liability and it is, therefore, by the condition of these societies, above all others, that the condition of the movement must be judged. The Report is full of evidence that there is every reason to regard it as satisfactory. The average membership of societies declined from 75 to 73 which is all to the good and the average sum available per head rose from Rs. 65 to Rs. 71. The reserve fund increased from Rs. 3.19 lakhs to Rs. 4.33 lakhs. Most satisfactory of all, although the total amount outstanding on loan at the end of the year was Rs. 64.88 lakhs, only Rs. 4.68 lakhs or 7 per cent of this was overdue. Mr. Ewbank and his staff are much to be congratulated on these figures. Authorized extensions granted to members by managing

committees are not included in the total but, even so, they show that the state of the collections in Bombay presents none of the disquieting features revealed by recent Reports from other parts of India. Mr. Ewbank gives a very interesting analysis of the objects for which loans have been granted. 66 per cent were for current agricultural expenses, purchase of cattle and implements, land improvement and payment of land revenue and irrigation dues. Buildings and repairs account for three per cent, domestic expenses for five per cent and trade for another five per cent. Redemption of debt accounts for 18 per cent or Rs. 11.50 lakhs, an amount which Mr. Ewbank confesses considerably surprised him as central banks have been very chary of giving loans for liquidating old debts, partly because they are always required for long periods and partly because the security is often suspect. He concludes that societies have taken matters into their own hands and used their deposit capital to a greater extent than had been supposed for the liquidation of debts. The percentage of loans granted for domestic expenses such as funerals and weddings is certainly not too high whilst the fact that Rs. 2.97 lakhs were advanced for the payment of land revenue and irrigation dues does not mean that the members of societies were unable to pay these without borrowing but that they are learning to hold up their stocks on a rising market for better prices. This is a very sound policy provided they do not hold them up too long. We agree with Mr. Ewbank in thinking that the statement shows that working capital is being handled wisely and devoted to proper objects in reasonable proportions.

The rapid multiplication of communal societies is perhaps the most interesting feature of the working of non-agricultural credit societies. Mr. Ewbank regards this as evidence that the caste system seems to be as firmly rooted as ever and holds that the best course is to accept it as a basic fact of

society and to make use of it as far as possible for extending co-operation. The biggest of the communal societies is the Shamrao Vithal Society of the Kanara Sarasvat Brahmins which has a working capital of Rs. 3'80 lakhs but, big as it is, it is a small affair compared with the G. I. P. Railway Society with its capital of Rs. 13.55 lakhs. We are sorry to see that the enthusiasm which started societies for debt redemption amongst the mill-hands of Bombay, from which great things were expected, has died down and that many of the societies are now in a parlous state. Mr. Ewbank considers that experience has shown that debt redemption should not be undertaken at the outset but only after a society has worked for some time and as a reward to those members who have proved themselves punctual and thrifty. The Social Service League is now forming societies amongst the mill-hands on this principle. Societies exclusively confined to the depressed classes in Bombay have never done well and are gradually being wound up. Madras has done much better in this respect for, there, such societies are numerous and flourishing, largely owing to the interest taken in them by Chairmen of Municipal Councils, Secretaries of the Young Men's Christian Association, and the Fisheries Department.

The organization of agricultural non-credit societies has been a special feature of co-operative work in Bombay since the passing of the Act of 1912, and "Co-operation in agriculture" has made greater progress in that Province than in any other. In 1917-18, the twenty-one manure purchase societies bought over 8½ million pounds of manure, mostly castor, ground-nut and safflower cake. The four cotton sale societies in Dharwar sold 90,700 maunds of cotton of 28 pounds each and the four in East Khandesh, 12,654 cart loads. Other sale societies did even better. The Baramati Society sold over 4½ million pounds of jaggery and the Nira Society over a million pounds. It is only fair to mention,

however, that the depôts for the sale of jaggery produced by these societies are managed by the agents of the Bombay Central Bank. The Islampur Society which has no such assistance sold nearly a million pounds of jaggery and ground-nut and that at Shenoli over half a million pounds of jaggery, ground-nut and turmeric. Eight seed societies were started in Khandesh in 1917, with the object of obtaining seed of the *roseum* variety of cotton from the Government farms, growing it through the agency of registered growers and distributing the seed so produced in the second generation to their members. The unfavourable season handicapped the experiment and the seed society at Gadag which disposed of Dharwar American, Cambodia and *kumpta* seed was much more successful. The number of societies specially devoted to the ownership of agricultural implements to be let out on hire increased to ten. Five of these owned iron ploughs, three an oil-engine and cane-crusher and two a cane-crusher only. Mr. Ewbank attributes the increase in this class of society to the growing scarcity and cost of labour which makes labour-saving machinery a necessity and also to the fact that, owing to the high prices of produce, agriculturists have more money to invest. The ten cattle breeding societies were fairly successful. As this is a somewhat uncommon type of society, its working merits a brief description. The aim is to gather a herd of about sixty cows, to obtain a separate grazing area and to own a breeding bull. The herdsman daily drives the cows out from their different homes accompanied by the bull to the pasture, keeps off other bulls, notes all coverings and maintains a herd book. The obstacles to a rapid increase in the number of these societies are the difficulty and expense of procuring good bulls and the necessity for securing separate grazing areas. Mr. Ewbank mentions that recommendations for grants-in-aid have been submitted to Government. We trust that

they will be accepted for an improvement in the breed of cattle is a matter of more than local importance. The four cattle insurance societies only started work in 1917-18 and the eleven dairies made little progress during the year.

As for other non-credit societies, the housing societies in Bombay are doing exceedingly good work and seem to be solving the problem of house room in that exceedingly congested city so far as their members are concerned. The Saraswat Housing Society erected five handsome buildings accommodating forty-two families at a cost of Rs. 1½ lakhs. Weavers' Societies in Bombay appear to be rather more hopeful than they are elsewhere but we trust that the improvement recorded by Mr. Ewbank in 1917-18, was not a flash in the pan due to the abnormally high price of cloth prevailing in 1918. The formation of a Union of ten Weavers' Societies at Dharwar for the wholesale purchase of yarn was a step in the right direction.

The working of the central banks and of the Bombay Provincial Bank calls for little comment. The large increase in the working capital of the former shows that they are successfully fulfilling one of their main objects, that of broaching new sources of finance at the larger centres in the mofussil. The guaranteeing unions in Bombay are a recent development. There are now 31 of them with 179 affiliated societies. Mr. Ewbank explains that they would be much more numerous were it not that, in the past, societies in the Bombay Presidency were sprinkled about broadcast and are, consequently, not situated in groups suitable for combination into unions. Progress will be more rapid in future as attention is now being directed towards forming new societies round specially good old ones so that, as soon as they become firmly established, unions may be registered. But Mr. Ewbank points out that unions have so much to learn before they can be trusted to operate large cash

credits from a central bank that it is essential to move cautiously and to train the committee carefully in their duties before allowing them to start work.

The amount of work which is done by voluntary effort in Bombay is very marked and is gratifying evidence of Mr. Ewbank's own enthusiasm and tact for, in securing voluntary workers, everything depends upon the personality of the Registrar. Each district has a staff of Honorary Organizers and Assistant Honorary Organizers and, except in the case of non-credit societies, all new societies are formed and supervised by unpaid non-official effort. Bombay has its Central Co-operative Library, also run by voluntary agency under the chairmanship of Mr. Lalubhai Samuldas, a well-known figure in the co-operative world, and, since the close of the year under review, has a Central Co-operative Institute. The Committee of the library issue the Bombay Co-operative Quarterly and we entirely endorse Mr. Ewbank's high praise of that journal, which is a model of what a co-operative periodical should be. It is satisfactory to learn that its circulation is such as to make it self-supporting. The success of the Co-operative Secretaries Training Class, the holding of a Provincial Co-operative Conference and of six local conferences and the propaganda work of the Co-operative Housing Association are all additional evidence that co-operation in Bombay is very much alive and is playing an increasing part in the life of the Presidency.

AGRICULTURAL PRODUCTION IN GERMANY BEFORE THE WAR.

BY B. NARASIMHA IYENGAR, B.A., Ph. D.,

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THE enormous increase in agricultural production in Germany during the last 25 years preceding the war was quite unparalleled in her history. This increase which began in 1879, soon after the introduction of protective tariffs by Bismarck was temporarily interrupted through the weakening of this policy by Caprivi, but the progress commenced again soon after the return to the old policy of Bismarck.

The increase in yield per acre of all the principal crops from 1885-86 to 1912-13 was as follows :—

Crop	Yield per acre in cwts.	
	1885-86	1912-13
Rye	9'44	14'80
Wheat	12'08	18'10
Barley	12'00	17'52
Oats	11'30	15'52
Potatoes	81'44	120'26
Meadow Hay ...	26'16	37'36

In addition to this increase in yield per acre, the increase in area under each crop was as follows :—

Crop	Area cultivated in acres	
	1885	1913
Rye	14,569,600	16,035,375
Wheat	4,822,650	4,935,250
Barley	4,556,550	4,134,500
Oats	9,561,300	11,095,375
Potatoes	7,296,500	8,530,100
Meadows	14,771,300	14,808,500

From the above two tables we see that the increase in yield per acre has been accompanied by an increase in the area under each crop also. In fact the total increase in area under grain crop was about 1,750,000 acres. The increase in the total grain crop produced was about eight million tons, thus giving an average increase of four cwts. per acre.

A comparison of the two periods 1885-89 and 1908-1912 is shown below :—

Crop	Total produce in tons.		
	1885-89	1908-12	Increase per cent
Wheat	2,913,882	3,962,390	36'0
Rye	6,890,588	11,012,170	59'8
Barley	2,619,559	3,220,066	22'9
Oats	5,411,131	8,189,062	51'3
Potatoes	29,705,780	44,220,213	48'9
Hay	19,336,392	25,024,472	29'4

These figures for the increase in crop bear ample testimony for the good work done by German Agriculture during the period under consideration. A comparison with the period 1908-12 is not very favourable, for 1911, the

year of drought which in many parts of Germany decreased the yield enormously falls during this period.

In addition to the above comparisons which show us the increase in acreage and yield per acre, we have now to find out whether the increase has kept pace with the increase in population during the same period. The population rose from 47,925,000 in 1885-90 to 65,866,000 in 1911-12. During the above period the annual consumption of Rye per head of population increased from 135'2 kg. to 140'1 kg. and that of wheat from 69'3 kg. to 87'6 kg. Here we see that the consumption of wheat has increased enormously, and this demand could only be met by increasing imports which rose from 305,293 tons in 1885-90 to 1,682,317 tons in 1911-12. Only with regard to Rye, Germany had an increase for purposes of export. In fact instead of the import of 577,425 tons in 1885-90, she had an export of 613,308 tons in 1911-12 in spite of the increase in home consumption. The necessity for import of wheat owing to increased consumption per head of population was also decreasing gradually. During the period 1906-10 it amounted to about 33'81 per cent, in 1911-12 to 29'21 per cent of its consumption. Experiments were in progress to put an end during the next decade even to this import by breeding suitable kinds of wheat which could give high enough yields even on light soils exposed to rough weather. The only fear of not realising their expectations was about some unfavourable alteration in the legislation, lack of labour, war or some other unforeseen event.

Under other field crops, the increase in the yield of potatoes was so enormous that it became almost a calamity in 1912. This increase was of very great economic importance. Through the further development of the drying industry, this increased crop was to be made to serve to supply the deficit in bread corn and to replace the barley used for

feeding animals and thereby save to the country a sum of twenty million pounds which was being paid for the imported wheat and barley. A beginning in the direction had already been made, the necessary methods and apparatus were there and it only required some improvements in the details of it. Through continuous progress in these lines, it was hoped to save fifty million pounds paid for imported concentrated feeds from abroad.

Only with regard to oats was very little variation with regard to the imports. During the years 1885-90 only 3'40 per cent of the consumed quantity was imported, and in 1911-12 it was still 3'33 per cent of it. This shows that production has kept pace with increase in population. Through further intensive cultivation, and making arable vast stretches of moor and heath lands, it was hoped not only to satisfy the Home demand in the near future but also to develop an export trade in it. Besides there was the possibility of substituting potatoes for feeding purposes and dispense with the imported oats.

Only with regard to barley, there was very little probability of satisfying the demand through Home production. 18'57 per cent of consumption was imported in 1885-90 but 53'28 per cent in 1911-12. As most of the imported barley was for purposes of feeding animals, it was hoped to substitute potatoes for it.

This short review of the production of German agriculture shows us that so far as the nutrition of people and animals was concerned, the production has partly kept pace with increase in population and partly exceeded it. There was a deficit only with regard to wheat and barley and ways and means were under consideration to supply the deficit through increased production during the next decade.

The development of animal production in Germany also shows considerable progress

during this period as seen by the following table.

Animal	Number of millions	
	1883	1912
Horses	4.50	4.50
Cattle	15.75	20.25
Pigs	9.25	22.00
Goats	2.50	3.33

In contrast to the above increase, is the decrease in the number of sheep which fell

from 19 millions in 1883 to 5.75 millions in 1912.

The number of animals maintained on farms of different sizes is not quite uniform. The largest number of horses, cattle and pigs is to be found on holdings ranging in extent from 5 to 250 acres, whereas goats and poultry are abundant in holdings under five acres in extent. The maintenance of sheep is strongest on holdings of more than 50 acres in size.

On the distribution of animals on holdings of various sizes the following statement gives information:—

Size of holding	Horses		Cows		Sheep		Pigs		Goats	
	Actual number	Percentage of total	Actual number	Percentage	Actual number	Per cent	Actual number	Per cent	Actual number	Per cent
Under 5 acres ...	71,369	2.05	1,026,529	9.93	415,750	4.66	4,383,244	23.23	2,697,206	73.8
Between 5 and 250 acres ...	2,767,102	79.26	8,305,477	80.32	4,134,746	46.34	13,096,402	69.42	948,388	25.9
250 acres and more ...	652,536	18.69	1,007,959	9.75	4,371,103	49.00	1,386,272	7.35	8,314	0.2
Total ...	3,491,007	100	10,339,965	100	8,921,599	100	18,865,918	100	3,653,908	100

Besides 96 to 98 per cent of all poultry in the country is maintained on farms less than 250 acres in extent. Considering the size of a farm and the animals maintained on it, it is also clear from the table that the smaller farms maintain a larger number of animals

than the bigger ones. The following table gives the number of animals maintained in Prussia on each unit of area utilised for agricultural purposes on the various sizes of farms:—

			Horses	Cattle	Sheep	Pigs	Goats	Poultry
1. Small holdings under $1\frac{1}{2}$ acres.								
1895	...	...	4	82	74	505	386	...
1907	...	...	2	66 (60)	60	662	387	3,080
2. Holdings between $\frac{1}{2}$ and 5 acres.								
1882	...	...	3	90	50	137	122	...
1895	...	...	6	80	28	164	90	...
1907	...	...	5	81 (62)	19	214	106	993
3. Holdings between 5 to $12\frac{1}{2}$ acres.								
1882	...	...	7	77	27	51	8	...
1895	...	...	8	78	17	83	10	...
1907	...	...	9	90 (58)	12	115	14	473
4. Holdings between $12\frac{1}{2}$ to 50 acres.								
1882	...	...	14	52	33	29	2	...
1895	...	...	14	56	21	49	2	...
1907	...	...	15	69 (36)	14	70	4	277
5. Holdings between 50 and 250 acres								
1882	...	...	12	38	60	17	0.4	...
1895	...	...	13	43	37	27	0.5	...
1907	...	...	13	53 (22)	25	40	0.9	150
6. Larger than 250 acres.								
1882	...	...	7	19	148	6	0.06	...
1895	...	...	8	25	76	10	0.16	...
1907	...	...	9	33 (14)	58	19	0.30	49
7. Larger than 500 acres.								
1882	...	...	7	17	157	5	0.05	...
1895	...	...	8	23	82	10	0.07	...
1907	...	...	9	31 (12)	65	17	0.08	40

N. B.—The figures in brackets show the number of cows maintained for milking purposes.

The above figures show also the relative increase in the number of animals of all kinds since 1882. They also bring out the fact that more horses are maintained per unit of area in holdings ranging between $12\frac{1}{2}$ and 250 acres in size than in the other ones.

The number of cattle maintained per unit of area is largest in holdings between $1\frac{1}{2}$ and $12\frac{1}{2}$ acres, sheep on the large sized holdings, whereas pigs, goats and poultry are abundant on the smaller holdings varying from $1\frac{1}{2}$ to 5 acres in size.

The largest number of animals maintained per unit of area and consequently the largest quantity of meat produced is thus to be found on small holdings, but with regard to the quality of the animals maintained and meat produced the larger farms take the lead. This is probably due to the better stabling and feeding conditions possible on the big estates.

It is very improbable that the big farms can ever maintain the same number of animals per unit area as the smaller ones. For the breeding of young animals through individual attention and care, the smaller forms are decidedly at an advantage. The work of an energetic, intelligent and careful wife of a small farmer who actually loves the animals under her care cannot be well substituted by paid labour upon whom the big farmers are dependent for that kind of work.

With regard to stock-breeding, all farms—big or small—have the same interest at heart, and there is a very good division of labour between the two. The small farms usually maintain good female animals for breeding purposes. When the young ones have become independent of the mother, the bigger farmers purchase such animals and allow them to grow further or fatten in their estates. In horse breeding for example, many of the valuable mares are in possession of small farmers who can attend to them personally whereas a big farmer with his paid servants runs a great risk in maintaining them. On the other hand the small farms do not possess the necessary pasture for the young animals to roam about and develop their muscles and tendons normally.

Let us now consider the agricultural technical industries such as sugar-making, distillation of spirits, manufacture of starch, etc. These technical industries not only get their raw materials from agriculture, but also give their waste and bye-products in the form of feeding stuffs or manures back to Agriculture. Those waste and bye-products cannot

be utilized otherwise at all. In this way all the mineral constituents which the plants had taken up from the soil and a part of the nitrogen is again returned to the land while the main products—sugar, alcohol and starch—built up of the elements of the atmosphere are exported out of the estates.

These industries so intimately connected with agricultural production, stimulate it to a great extent. The production of such crops as sugar beets and potatoes required a very careful cultivation, manuring, seed selection and consequently a good foundation was laid for intensive cultivation.

The other technical industries such as beer-brewing, milling and baking, even though they have a connection with agriculture in working up the raw agricultural produce while their waste and bye-products are ordinary objects of commerce, are not dependent on any particular agricultural area for the establishment of the necessary factories.

The cultivation of the sugar beet in Germany increased from 923,120 acres in 1889 to 1,261,850 acres in 1911 while the number of sugar factories decreased from 403 to 340. The quantity of beets worked up during the same period rose from 10 to 15'75 million tons and the molasses produced from 254,000 to 328,000 tons. The yield of beets per acre varied from 12 to 13 tons but went down to 7 tons in 1911, the year of severe drought. The production of raw sugar itself was as follows:—

1881-1892	Average per year	1,099,549 tons
1892-1897	do	1,506,344 „
1897-1902	do	1,826,125 „
1902-1907	do	1,876,889 „
1907-1912	do	1,973,802 „

The following table gives some idea of the improvements on the manufacturing side.

1884-89 one cwt of beets yielded 12'91 lbs. sugar.

1889-94	do	12'91 „
1894-99	do	14'09 „
1899-04	do	15'43 „
1904-09	do	16'74 „
1910	do	16'62 „
1911	do	17'56 „
1912	do	17'20 „

These figures clearly show the effect of intensive culture and manuring, the perfection of the manufacturing process as also the effect of plant-breeding in producing a beet with a high sugar content. If the beet itself had not actually been made richer in sugar, it could not have been possible for the factories to get a larger amount of sugar out of the same weight of beets in spite of their perfection of manufacturing machinery.

The decrease in the number of factories is not to be interpreted as a decline of the industry. The explanation for this phenomena is that the smaller ones could not stand the competition with the better organized bigger ones, and had to make way for them consequently. At any rate Germany produced in 1912 nearly twice the quantity of sugar she did before 25 years, and during the same period the average sugar-content of the beet itself rose from 12'51 per cent to 15'67 per cent, i.e., an increase of 25'3 per cent.

The disposal of this enormous production of sugar had its own difficulties. Owing to increased production and protective tariffs of the other countries, the export of German sugar gradually went down, and during 1907-12, only 40 per cent of the sugar produced could be exported. Luckily, the tax on the beets was first reduced 50 per cent and then completely abolished in 1892. In its place a tax was levied on manufactured sugar, and the annual consumption also rose from 20'35 lbs. to 43'31 lbs. per head of population.

That there is a great probability of more sugar being consumed in the country itself is seen from the following table:—

Country. Annual consumption of sugar in lbs. per head of population

1. England	...	92
2. North America	...	83
3. Denmark	...	77
4. Switzerland	...	55
5. Sweeden and Norway	...	46
6. Germany	...	43
7. Holland	...	41
8. France	...	34'5
9. Belgium	...	31
10. Austria	...	24

Germany stands sixth in the above table. By further decreasing the tax on the manufactured sugar, it was expected that more of it would be consumed in the country itself thus freeing her from the anxieties of export and making her independent of foreign markets for the sugar produced.

Of the industries dependent on potatoes as raw material, the manufacture of spirits stands first on the list. Only about 10 per cent of the potato crop is used up by the industries connected with it, and the major part of the crop is consumed by human beings and animals. The distribution of the annual crop of 45 million tons was as follows:—

16'3 million tons	for feeding animals.
13'0	„ for human consumption.
6'6	„ for seed purposes.
4'6	„ for industrial purposes.
4'5	„ lost during storage.

The distilleries passed through many a crisis. The consumption of spirits in the country itself went down gradually, and the export trade could not stand the competition in the foreign markets and consequently decreased enormously. On the other hand, the use of alcohol for industrial purposes increased by leaps and bounds, and this has saved the distilleries from being ruined.

Let us now find out the reasons for this enormous increase in agricultural production. On a close examination, we see that the reasons are manifold.

The development of the natural sciences from the middle of the 19th century furnished the foundation for developing and perfecting the art of agriculture. Liebig summed up the results of the progress in natural sciences during his time and created a new and more exhaustive theory with regard to the nutrition of plants and animals than that which existed till then. This new branch of science was called "Agricultural Chemistry" and brought new life into agriculture. In the fifties and sixties of the 19th century, the practice of draining the land through tile

drains was copied from England and the adoption of that system drained, ventilated and warmed vast stretches of arable land, and laid the foundation for introducing a system of intensive culture.

The teachings of agricultural chemistry found practical application first in the old centres of beet cultivation in the provinces of Saxony, Brunswick, Anhalt, etc. In the same way as these beet farms on heavy soil and the sugar factories connected with them, there arose in regions of light soil other farms with distilleries and starch factories, thus giving a strong impulse to intensive agriculture and stock maintenance. The growth of beets and potatoes demanded a deeper cultivation of the soil and heavy manuring. As a consequence of these better conditions of growth, weeds also began to grow luxuriantly and the farmers were compelled to have recourse to sowing in regular lines, to cultivate the interspaces and thus keep their land free from weeds. Hence the cultivation of beets and potatoes was the beginning for the perfection of the agricultural technic, and also the cause for the springing up of the industry of making agricultural machines in Germany. It was found out that the beet fields had to be ploughed up before winter if one wanted to secure all the benefits of the operation. With the then existing implements and stock it was found practically impossible to get through the necessary work in time. Then the steam plough was introduced, and the demand which thus arose for other power-worked implements such as seed-drills, cultivators, harvesting and threshing machines created the industry of agricultural implements. In the course of a few decades this new industry developed itself to such an extent as to greatly dispense with the import from England and America, and through its own exports began to compete successfully on the foreign markets with the older export industries of England and America.

The bye and waste products of the agricultural industries supplied a lot of feeding stuffs which necessitated the maintenance of more animals, thus increasing the production of manure and contributing to the increase of the fertility of the soil.

The whole system of agriculture gradually acquired the nature of an industrial and commercial enterprise. Through increased application of capital and labour, and a better understanding of the processes of nature, people learnt to compel nature to produce more than before and attained thereby more safety and uniformity in their crops than formerly.

The investment and faster circulation of large capital brought its own dangers with it, and called for the introduction of accurate book-keeping. This systematic book-keeping was gradually developed into a sort of research and control medium with whose help one could follow the increase or decrease of the profitability of the whole industry and its principal branches.

So we see that the agricultural prosperity of Germany began with the cultivation of such crops as beets and potatoes.

After a few decades of perfection of work on the lines indicated above, people began to realise that the then known and cultivated varieties of crops were not in a position to benefit by the improved methods of culture and yield a reasonable profit. Consequently in the sixties and seventies of the last century, better yielding varieties of wheat were introduced from England into the provinces of Saxony, Anhalt, etc. As these varieties did not very well stand the continental winter, and were not suited for the milling process in vogue in the country, a beginning was made to breed the varieties suited to the conditions and the needs of the country.

The increasing of the crop yields through better conditions of vegetation and improved strains of seed brought with it an increase in the diseases and insect pests of crops. Hence

the next stage in the development of agriculture was the development of plant pathology, a biological science which is as important to agriculture, horticulture, and forestry as veterinary science is to domestic animals.

Also the cultivation of the extreme types of soil, such as moor and sand, on the basis of the teachings of Rimpau, Fleischer, Schultz, Lupitz, and Hellriegel, led to a better utilization of those types of lands, increased their productivity and made the colonisation of these tracts possible. On moor land alone, there are still 5,700,000 acres awaiting improvement and cultivation.

Hand in hand with the above improvements in the technic of agriculture, went on extended application of artificial manures. In 1911, nearly 7 million tons of such manures were used in the country.

In the animal industry, in addition to the improvements on the breeding side, the improvement in methods of feeding based on Kellner's theories and experiments, the development of the dairies through the introduction and co-operation of bacteriologic, so also the controlling of the individual capacity of each animal are the causes which contributed to increased production of meat, milk, butter, cheese and other animal products. The necessary consequence of this improvement was the rapid increase in the import of concentrated feeds which in 1912 exceeded 50

million pounds sterling in value. Barley bran, oil-cakes, oil-seeds and oats are some of the most important concentrated feeds for which Germany is dependent on foreign countries.

Thus when we look into the original causes of this enormous development in agriculture, we find them in the close co-operation of science and practice, in the development of agricultural research and instruction of all kinds, in the development and fostering of the co-operative system and in the union of the farmers into clubs and societies each of which patronises some special branch of agriculture. For instance, the German agricultural society modelled on the English one is interested in the development of the technic, the farmers' union in the maintenance and improvement of economic conditions necessary for the agricultural industries, and the agricultural chambers as official bodies are busy in developing agriculture in general. Besides these, there are other special societies for special developments. Further, the development and improvement of the means of communication, specially the building of a huge net-work of light railways has contributed not a little to the prosperity of agriculture.

So we see that theory and practice, state institutions, private initiative, and self-help have all worked together harmoniously and contributed to the prosperity of the country before the war.

Let us now compare agriculture in Germany with that in the other civilised countries of the world. The distribution and use of land in the various countries of the world is seen from the following table.

Lands		Total area in 1,000 acres	Cultivated land		Meadows and pastures		Forest		Unused land	
			in 1,000 acres	per cent of arable area	in 1,000 acres	per cent of arable area	in 1,000 acres	per cent of arable area	in 1,000 acres	per cent of total area
Germany	...	135,162	64,427	50.4	21,657	16.9	34,988	27.4	7,277	5.4
France	...	132,390	59,230	47.6	25,105	20.2	23,322	18.8	8,047	6.1
Great Britain	...	78,058	18,032	26.8	29,225	43.4	3,105	4.6	10,740	13.8
India	...	629,002	293,770	62.6	...	...	82,140	17.5	159,460	25.4

The limitedness of agriculture in Great Britain and the extension of pastures and meadows is seen from the above figures. India, Germany and France show the largest area of cultivated surface. In most of the lands above 50 to 63 per cent of the cultivated lands is taken up by grain crop.

Let us now compare the area under each of the field crops in the various lands so far as the statistics are available in rounded average figures based upon a few years before the war.

Cultivated area 1,000 acres.

Lands	Wheat	Rye	Barley	Oats	Maize	Total area under grain crop	Potatoes	Sugar beets
Germany ...	5,500	15,500	4,000	10,750	...	35,750	8,250	1,250
Austria-Hungary ...	12,250	8,000	5,750	5,500	8,500	42,000	5,000	1,000
France ...	16,250	3,125	1,800	9,750	1,250	32,175	4,000	500
Great Britain ...	1,750	65	1,875	4,200	...	5,325	575	...
United States of America.	47,500	2,125	7,500	33,750	101,250	192,125	3,500	...
Russia in Europe ...	58,250	71,250	26,250	42,500	3,500	201,750	11,000	...
India ...	26,250	...	...	...	...	26,250	...	...

With regard to the cultivation of grain crop Russia heads the list for rye, wheat, oats and barley. Even the United States of America has not been able to approach her in this respect. If only Russia progresses steadily she can very easily supply the world's

demand for most of the grain. The United States take the lead only with regard to maize. India occupies the third place with regard to the area under wheat.

The next table gives the total production and the yield per acre.

Total produce in 1,000 tons and yield per acre in cwts.

Lands	Wheat		Rye		Barley		Oats		Maize			POTATOES.	
	Total	per acre	Total	per acre	Total	per acre	Total	per acre	Total	per acre	Total cereals	Total	per acre
Germany ...	4,200	8'0	10,000	7'0	3,200	7'8	8,500	7'9	...	...	25,900	45,000	54'4
Austria-Hungary	6,000	5'0	3'900	4'8	3,000	5'3	3,500	4'56	5,000	5'8	21,400	18,900	35'3
France ...	9,000	5'44	1,300	4'24	950	5'2	5,000	5'00	600	4'8	16,850	13,500	34'4
Great Britain ...	1,500	8'8	...	7'30	1,500	7'8	3,000	7'56	...	...	6,000	6,500	55'2
Russia in Europe	15,000	2'6	20,000	2'80	8,500	3'2	12,500	2'90	1,500	4'30	57,500	30,000	29
India ...	8,200	2'84	...	...	...	...	...	...	...	...	8,200	...	...

Taking into consideration the other countries of the world, the total production of grain amounts to about 302 million tons and Germany does not even produce 10 per cent of it. With regard to potatoes, the world's production being about 135 million tons, we see that Germany produces about one-third of it and tops the list towering above all other countries. With regard to the yield per acre, England surpasses Germany by a little, a positive proof that the quality of intensive agriculture in England is in no way behind that of Germany. On account of the free trade policy of England, the extent of cultivation in England and the total production of grain in the country itself has lost its importance. Only the best land is under the plough in England, whereas most of the arable lands has been converted into pastures and meadows, so that in this way at least through the minimum capital and labour the land could still be made to yield a profit. In Germany, on the other hand, even the poorer qualities of land being cultivated for the production of food grains, this naturally brings down the average yield per acre. In spite of all that, the fact that there is not much difference in the yield per acre between England and Germany speaks volumes in favour of German Agriculture.

Forty per cent of the total wheat export of the globe goes to Great Britain for the maintenance of the English Nation. In this way England imports annually about six

million tons of wheat, whereas Germany only 2½ million tons.

From the total produce of the globe, only about 14 to 15 million tons or about 15 per cent is available for purposes of export and the rest is all consumed in the countries of production. If the other countries of the world should follow the example of England and import large quantities of grain into the country, this must naturally lead to a rise in prices.

From the cursory view of the production of the world, it will be seen that a continuous increase in the world's population Germany could never think of making herself dependent upon other countries for her grain supplies. To ensure the supply of bread and avoid rise in prices, the only way left open for the central and west European states is the maintenance of their present rate of production and if possible increase it.

So much about grain production. Now about the animal production of the world. The statistics for most of the countries give only the number of animals, but no information about their weight and age which naturally varies a good deal according to the civilization of the country, and the standard of animal breeding and feeding. The difference in religion, ways of living, working and nutrition of the different peoples of the world, the variation of soil and climate in different parts of the earth, has a very decisive influence upon the animal production of various countries.

The following table, containing, of course, only approximate figures, gives an average view of the world's animal production in thousands:—

Country	Horse	Cattle	Pigs	Sheep	Goats
Germany	4,345	20,631	22,147	7,704	3,534
Austria	1,803	9,160	6,431	2,429	1,156
Hungary	2,174	7,153	5,490	7,905	309
France	3,198	14,532	6,900	17,111	1,418
Great Britain	2,095	11,765	3,565	31,165	243
Russia in Europe	24,149	36,769	11,584	45,829	...
United States of America	23,016	63,683	59,474	52,839	3,030
India	1,553	119,379	...	23,235	3,060

Only statistics on the export of meat and animals from a country is the index to meat supply of the world. Only America, Argentine, Australia and Denmark export considerable quantities of meat and live stock. England imports nearly 45 per cent of her meat consumption whereas Germany imports only 4.7 per cent. Even this small import was going back in the last decade before the war. But as already stated, the production of meat in Germany was dependent upon the foreign supplies of feeding stuffs.

Such was the position of Germany in Agriculture before the war. She had not only a flourishing industry, but also a good system of intensive agriculture. What the condition of this agriculture was during the war, the difficulties in the way of maintaining it at the high pre-war standard, and the demands made upon it and how she tried to meet all these shall form the subject of another article.

The Travancore Government have passed orders regarding certain proposals submitted some time ago by Dr. Barker, Director of Industries, for expanding the scope and usefulness of the Department under him. They have approved of Dr. Barker's proposal for oil distillation in North Travancore and jaggery manufacture in Central Travancore for demonstration purposes, and an oil distillation expert has been appointed. Under cottage industries, Government sanction all of Dr. Barker's proposals regarding the opening of a depôt at Alwaye for bamboo furniture, another at Mavelikara for the screw pine industry and a weaving depôt at Eraniel. The Director's proposals for an industrial survey for the development of glazed pottery and plantain-fibre manufacture are also sanctioned.

THE PROBLEM OF HIGH PRICES IN INDIA.

BY R. K. SANGAMESWARA IYER, M. A. L. T.

"The anger and consternation of all classes of our people at the refusal of war prices to fall, now that the Great War is over, are a chief element in our national unrest. Nor are we consoled by the knowledge that the price level is far higher among our continental allies and in several of our neutral countries"—*Nation*.

Even in normal times the question of prices is an extremely complicated problem in economics. To the usually intricate web the world-war, that has presented us with such new, wonderful and awe-inspiring experiences in various spheres, has added its own intricate threads to make the confusion worst confounded. We should, however, be neither dismayed at nor lose hope by the more stupendousness and complicated nature of the causes that have been responsible for bringing about this abnormal rise in prices of the necessities of life in our country. Vital as the problem is, especially to a poor country like India that cannot bear this strain for long, an attempt is here made, however incomplete it may be, to throw some light on this vexed problem.

To a person who carefully studies the Indian conditions the bearing of currency prices is, perhaps, the most striking. It is a well known economic doctrine that the quantity of 'money' (*i.e.* metallic money as well as paper) in a country is an important factor in determining prices; that an increase in the quantity of money raises prices and a diminution lowers them. The application of this doctrine to the Indian conditions has got a short history behind it. When a rise in prices occurred in the first decade of this century, it was mainly attributed to the large increase in the volume of the rupee currency, by the Indian economists and the Indian press, ably led by the

late Mr. Gokhale. According to them the closing of the mints and the adoption of the gold exchange standard made the rupee a token coin with the result that the rupee currency lost at once the capacity of automatic adjustment to the needs of the country; therefore an inflation of currency resulted in an inflation of prices.

But the Government of India of the time, maintained that the currency had nothing to do with rise in prices and that the simultaneous movement upwards in prices and in the volume of currency was merely accidental, and endeavoured to explain high prices by attributing it solely to the adjustment of India to world conditions.

Two clearly marked out stages could be perceived, in this century, during which the prices rose steadily, intervened by a period of comparatively steady prices. The years 1903-08 mark out the first stage, and 1914-19 mark the second. Let us now examine the following tables:—

Table I.

Year.	Coinage of Rupees (in crores)	Index nos. for Rice at Calcutta. (1873 100)
1901-02	... 4'95	110
1902	... 11.27	(?)
1903	... 16'53	128
1904	... 11'38	129
1905	... 20'00	142
1906	... 26'08	154
1907	... 18'12	155
1908	... 2'85	191
1909	... 2'17	156
1910	... 2'19	148
1911	... 2'80	142
1912	... 19'53	145
1913-14	... 13'15	187
1914	... 2'17	?
1915	... 1'62	197
1916	... 32'32	230?
1917	... (?)	280?

Table Ii.

Year	Gross circulation of Notes (in crores of Rupees)		
1900-01	25'58
1906-07	45'12
1912-13	65'62
1913	63'9
1914	60'3
1915	62'4
1916	84'4
1917	104'8
1919 (proposed)	120'0

Table I shows how the heavy coinage of rupees that commenced in 1902 was kept up till 1908; then follows a steady but negligible rate of addition between 1908-13; the second period of heavy coinage commences again from 1913. These facts must be taken in conjunction with those of Table II which shows how the circulation of notes almost double in the period 1903-08; and also how the increase in note circulation has always kept company with increase in the rupee currency. During the last 2 or 3 years the issue of rupees and notes reach the high water mark in the history of Indian finance, and it is also in these years that the prices have risen to the highest point ever recorded.

The above figures tell their own story; at each stage a large addition to the volume of currency has been immediately and systematically followed by proportionate inflation of prices. Hence the simultaneous movement in currency and prices is not a mere coincidence; the rise in prices in the first decade and more especially the abnormal conditions of the last two or three years, are very largely if not monthly due to the enormous inflation of the currency in the country. "The effect of heavy coinage are cumulative. The Indian authorities do not seem to have understood this"* is therefore quite true.

This increase in currency must again be viewed from another standpoint to realise its full effect on prices. Everyone is familiar with the slackness in trade, both internal and

external, during the war years and after. What the railway and wagon difficulty did to bring the internal trade to a stand still, that the shortage in tonnage did to make the seaborne trade, poor and uncertain. In periods of slack trade even the existing currency will be found superfluous in any country, much more so here where the currency is inelastic. Therefore the large additions to the existing currency, and that too in a period of slack trade have tended to doubly react on prices.

Next in importance comes the question of scarcity of food-stuffs and its effect on prices. Here a clear understanding of the cause of this scarcity is all important. Is the shortage due to under production in the country or is it due to heavy exports? Let us now see whether India produces enough to support her own population in normal years.

Year	Acres under cultivation (in millions)	Yield per acre of food crops (in lbs.)	Population (in millions)	Agricultural Produce per head (in lbs.)
1880 ...	194	730	181	782
1901 ...	217	840	220	830
1916 ...	221	900	250	796

Although the food supply has not kept pace with the growth of population in the last two decades, yet a comparison of agricultural produce per head of population in 1880 and in 1916, shows us that the conditions of 1916 are far better than those of 1880, though the actual condition of 1916 is far worse. Therefore, the rise in prices of food stuffs cannot be attributed to scarcity as a result of insufficient production but to scarcity as a result of reckless export without caring for the needs of the country. Even the most hesitating mind has now been set at rest on this point as the Hon. Mr. Mant has stated in the current session of the Imperial Council that "The one thing

that saved India from disaster in the present year is the fact that *she normally exports food grains.*" When the situation is described in such strong language by a member of the Government one can easily imagine what an ordeal the country had undergone and how very near the verge of disaster it ought to have been in the last year or two. Bearing in mind Datta's remark "that India proper is gradually ceasing to be an exporter of rice and approaching the stage when it will have to obtain supplies of it regularly from Burma and other countries," it is evident that reckless and abnormal export is an important cause of the present abnormal conditions.

The increase of money and the shrinkage of supply do not, however, in themselves account for all the trouble. The oppressively high prices of food-stuffs and other necessities of life might also be directly traced to the half-hearted incomplete way in which the distribution has been effected. Ever since the era of Railways we have been familiar with the part they played in fair distribution and the influence they exerted in bringing down prices to a common level throughout the country. In the last few years, however, the poor railway facilities, and the short sighted, insular railway policy make one believe that railways have ceased to exist from the point of view of efficient and effective distribution. In pre-Railway days, the price was low in tracts of plenty at least, but not so now. The phenomena of "a province with abundance of food bordering on a district with a population starving for want of the same" so common in pre-Railway days has, in the last few years, given place to the more curious phenomena of a taluk or district with abundance of food surrounding towns and villages, where the population struggles for existence. Speculation and profiteering have been rampant; its opportunities are innumerable. Merchants and middlemen have been hankering after war-profits by cornering and other devices;

bags of food stuffs that should at least have gone to relieve local distress, have often had a tendency to accumulate in the railway sheds, already full to overflowing. Under these circumstances the only agency that could have managed the situation and relieved the strain would have been the Government; it should have taken upon itself completely the control of supplies and the work of distribution. In isolated instances where it had done so it has been a real boon to the locality. To cite an instance in Kurnool, which is, not a rice producing country, rice has been selling at $3\frac{3}{4}$ seers (Madras) per rupee, as a result of Government control; while at the same time at Erode, which is in the midst of a rich rice producing centre, the same commodity sells at $1\frac{3}{4}$ Mad. seers per Rupee! The way in which the kerosine oil was distributed is too notorious and fresh in the minds of every one to need comment. To give the other side of the picture, the economic situation in the native State of Mysore has never been so acute as that in other parts of the country; and this is wholly due to the prompt action of the Government of that State by way of wholesome restriction of exports and proper control and distribution of food-stuffs in that province.

Let us now turn our attention to a wider field and consider India as a world unit, that is, let us just look at the external causes that have indirectly contributed their share to the present situation in India. An account of the Great War a very large number of men,—30 to 40 millions perhaps—of the best productive age have been suddenly shifted from productive processes into the trenches—an occupation which from the economic point of view may be considered as waste and useless. Add to these again, the far larger numbers of 'war-workers' that were mainly engaged in innumerable factories and industries connected with war. Now, considering the world as a unit, it had the great burden of supporting many millions of its

most able bodied men, who contributed no useful share to the world's production for a considerable time. This large strain over resources of the world, enhanced by transport difficulties and poor or no production in vast tracts of land in and around the war zones of three continents has materially affected the supply of food-stuffs in the world as a whole. Now, though the war is over the difficulties and uncertainties of demobilisation, and "the delays in readapting the industrial plant from war to peace purposes," leave the position almost unchanged. Hence the shortage of food-stuffs throughout the world and the universal rise in prices, from which India cannot escape.

Again, 'the artificial abundance of money' seems to be a world disease. In the words of a recent writer—"The major part of the price-rise in every country has probably been due to the inflation of the currency. The use of our banking system to create credits for direct or indirect lending to the Government has been a larger, subtler and even more dangerous inflation.....We are not living on a basis of honest money and the least scrupulous Government of our times still wields power to debase the currency. The continuance of gigantic unproductive expenditure by the Governments notes industry of the capital it needs for reconstructed and expanding industry. This reduces the supply of goods, while it involves a further creation of bad money." Such is the state of the world; so long as this state of things persist in the outside world the prices in India cannot come down quickly. To quote the *Nation* again, "there is no near prospect of relief. When the armistice came everyone anticipated a gradual decline of prices as industry and commerce began to assume their normal shape. Now the oracles are dumb. And yet the situation is one that calls for a clear and tolerant judgment. For it is both difficult and dangerous." May the Commission, to be soon appointed, successfully solve this vital problem for poor India.

MODE OF PREPARING SEED-LAC FROM CRUDE STICK-LAC.

BY L. S. SUBRAMHANYA IYER, B.A.,
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Bangalore.

LAC in its raw state is an incrustation round the twigs of trees on which it is formed by the Lac-insect and in this state it is called *stick-lac*. The stick-lac as such or after scraping off the twigs should not be stored away, or transported over long distances as certain insects and fungi which attack the lac-insects and the lac while yet on the trees will remain alive in the lac-incrustations and damage the quality and quantity of it even after scraping, thereby diminishing the quality and its commercial value. There is also the risk of fermentation setting in by storing away such lac in bags or other receptacles, thereby lowering the percentage of lac-resin.

The first thing to be done is to scrape the lac-incrustations off the sticks immediately they are removed from the trees. This is done in one or more of the following ways:—

1. by twisting the stick when the incrustation loosens and falls off,
2. by scraping off the incrustation by knives,
3. by driving a roller over a layer of incrustated twigs spread evenly and picking off any lac adhering to the sticks,
4. by a combination of roller and sieves as in the modern improved process, which not only separates the sticks from lac, but also crushes the lac and grades it into coarse and fine grains.

The crude lac after being removed from the sticks must not be dried in the sun as this may tend to melt and turn over the edges of cells of which it consists, thus forming what

is commercially called "*Agglutinated lac*" from which it is difficult to remove the dye.

Soon after scraping it is necessary to remove the colouring matter called *lac-dye* from the crude lac and to convert the latter into a condition fit for storage or use. Both these objects are realised by crushing the crude lac, cleaning it of all foreign matter such as bark and woody pieces of the twigs remains of dead lac-insects and its predacious enemies, and washing it repeatedly until the "*grain-lac*" ceases to impart colouring matter to the water used in washing.

Mr. Puran Singh, formerly Chemist of the Forest Research Institute at Dehra Dun, advises the preparation of "*seed-lac*" when the stick lac is still green, that is, when the albuminous and colouring matters are in a semi-fluid state. In this state the lac is easily pulped and the pulp readily gives off its colouring and albuminous matters which are then easily soluble. This may be easily followed by our Lac Farmers with great advantage as it will improve their product and its sale price. The pulping and washing can be done in the neighbourhood of the lac producing area itself, with the help of a mallet or pestle and mortar, to crush the *stick-lac* and a few tubs and mats to wash and dry the *seed-lac*. Women can easily clean the *seed-lac* of its remaining impurity, by hand-winnowing, in which they are adepts.

CONVERTING "STICK-LAC" INTO "GRAIN OR SEED-LAC."

Stick-lac is first pulverised either by beating with a mallet or pounding in a mortar or by a system of automatic rollers and sieves alternately arranged and worked by power. The first two methods are simpler, cheaper and more suited to our conditions, our output being too small for the third process. The pulverised lac is put in large troughs, vats or tubs provided with a stop-cock at the bottom. The lac is then covered

with water and allowed to soak for about 24 hours. After soaking it is thoroughly treaded, turned about and gyrated by men, with their feet. Thus the colouring matter is loosened and held in solution by the water, which when saturated with the dye called "*dye-liquor*" is run off by the bottom cock to a trough below, where the dye is allowed to settle down: sometimes lime-water or oxide of tin are added to hasten the deposition of the dye. This process of washing is repeated until the wash water runs clear and colourless.

The washed *grain-lac* is now dried in the sun, cleaned and sorted or graded into coarse grains, fine grains, and dust.

The lac in this form can be stored and is fit for transportation. Moreover being then freed from all extraneous matter, and considerably reduced in weight and volume, the cost of its transport will be appreciably lowered, while its price will be very materially increased.

It is found by experience that Kusam (Kan.-Sagade) lac keeps in good condition much longer than other kinds such as Palas (Muttuga), Pepal (Arali or Aswatha), etc. "The quality of lac varies according to the tree upon which the lac-insect feeds. The Kusam lac is said to last for ten years while all other qualities remain in good condition only for two or three years."

"Seed-lac" when stored for a long time becomes insoluble in alcohol, which is considered the proper solvent for *shellac* for the majority of commercial purposes for which *shellac* is used such as French Polish, Spirit Varnish, etc. This tendency to become insoluble is common to all forms of lac; but Mr. Puran Singh recommends the steeping in water for some time of such lac, to restore it to its original solubility.

Lac is used in India for making varnishes and polishes in lacquering wooden and metallic toys, ornamental boxes, etc., in fixing blades of knives to handles and hafts to swords, in filling in gold ornaments, for

making bangles, bracelets, rings, beads and other trinkets worn by women, especially among the poorer classes, for making button, shuttles, sealing wax, etc., in manufacturing grindstones, and in medicine.

In Europe, America and other western Countries, lac is employed for making sealing waxes, Varnishes, as a stiffening for silk and straw-hats in combination with other resins and gums, lithographic inks, gramophone records, as a cementing, luting material for uniting surfaces of wood, metal, glass, leather, etc., in making Japanese varnishes, for lacquering wooden and metal articles, and as an insulator in Electrical appliances.

[Note by Rao Saheb M. Rama Rao, Special Forest Officer:—The above note was prepared by Mr. L. S. Subrahmanya Iyer, at my request in order that a description of the method of converting *crude-lac* into marketable *seed* or *grain-lac* may be printed, translated and distributed among the forest leasees or contractors of Lac-Farms in the State. At present, they collect the crude-lac and sell it away after storing it for some time, at prices hardly a third of the actual market rates in Calcutta. For instance, the present market rate for crude stick lac is about Rs. 75 per Bengal Maund (82 lbs.) at Calcutta, whereas the present market rate at Bangalore is about Rs. 11 per local maund (24 lbs.). By storage, of *crude-lac* which contains living predacious insects and fungii, is considerably deteriorated in quality and quantity, thereby diminishing its utility and value. If the simple and inexpensive method described in Mr. Subrahmanya Iyer's Note of preparing *seed-lac* from the *crude-lac* is adopted by our lac Farmers, they will realise very good profits. Lac is one of the important articles of export from India. India is the largest and practically the sole supplier of lac to other parts of the world. The average annual export of this article is 20,000 tons valued at about three crores of rupees. Almost the whole of this quantity is produced in North India and Burma, South India contributing practically nothing. The Mysore State possesses the requisite conditions favourable for producing ten lakhs of rupees worth of lac annually, if her re-sources are fully developed.]

NEW SOURCES OF LEATHER SUPPLY.*

BY ROBERT G. SKERRET.

HERETOFORE, with minor exceptions, we have depended upon the skins and hides of land animals for the great bulk of our leather stocks. To-day, because of the reflexes of the war, and owing to diminished if not totally destroyed herds of cattle, sheep, goats, etc., we, with other peoples, are face to face with an unprecedented shortage of leathers. And, what is equally disquieting, this scarcity is going to lay a tax upon all of us.

The pinch upon our purses will come home most directly through the added prices that are certainly going to be charged for our footwear next fall and winter. The average pair of shoes will cost us something like a dollar more if the experts of the leather industry be correct in their prophecy. That is to say, the nation as a whole will have to hand out for its boots and shoes a matter of \$100,000,000 additional to cover its feet in the course of the next six months without gaining anything in the way of improved articles.

We are accustomed to boast of our self-sufficiency when it comes to raw materials, especially. It will, therefore, probably shock many good Americans to learn that the United States commonly relies upon the outside world for nearly half of its cattle hides, for well-nigh all of its goat skins, and likewise for a very large part of the pelts of sheep and calves consumed here. From an industrial point of view, the present leather shortage and outlook become even more serious when we recognize the fact that we have grown to be the leading nation among those manufacturing boots and shoes. What

are we going to do to make up the existing scarcity and to insure our factories against shut-down or woefully diminished output?

MANY USES FOR LEATHER.

During 1917 we imported 700,000,000 pounds of hides and skins, valued at the ports of entry at \$216,000,000. Since then, there has been a notable decrease in the quantities of leather stocks brought into the United States, and this falling off has reached hundreds of millions of pounds. Only a part of the leather worked up here annually goes into footwear. Much of it is demanded by the upholsterer; great quantities of it are used in the making of harness and saddlery; the glove trade levies a big toll; and then its employment is varied in the fabrication of travelling bags, handbags, pocket-books, and an endless multiplicity of other useful as well as ornamental articles. In the field of mechanics, leather meets with peculiar fitness numerous needs, and the whirring wheels of our factories and other services calling for power transmission would be at a loss if a sufficiency of leather belting were not available. Finally, the automobile and aircraft have brought to the fore the advantages of leather in providing especially suitable garments.

Manifestly, the demands for leather stocks are certainly going to increase rather than to diminish; and if the herds, the droves, and the flocks of land animals are inadequate, from what other sources can we obtain skins susceptible of being tanned and made fit to meet these manifold services? Happily for us the period of strife has stimulated research and brought about material achievements which otherwise might still be remote potentialities. Quite two years ago, the Department of Commerce urged the experts of the leather industry to see what they could do here towards successfully tanning the skins of a number of marine mammals and fish.

Previously, the skins of some domestic porpoises had been tanned but not in sufficient measure to loom at all conspicuous in

* With Acknowledgments to the *Scientific American*.

the volume of the native leather industry. There were two reasons for this. First, the catching of the porpoise was an infrequent occupation and we had little if any trouble in securing from long-established sources the desired amounts of leather stocks; and, next, porpoise leather for boots or shoes found only a limited use owing largely to the fishy odor that clung to the finished product. The more common employment of the leather was in the form of shoestrings. In England, on the other hand, for a good long time, the tanners have been producing a fine grade of so-called porpoise leather from the skin of the beluga or white whale, which attains a length of 18 feet or more and will average in girth from ten to twelve feet. This leather has great tensile strength and is remarkably well adapted to the making of machinery belts; and because it keeps its shape under varying stresses it is admirable for working into shoes. The beluga abounds in the waters contiguous to the northern coasts of this continent.

A CONCERN THAT HAS SUCCEEDED.

The most significant development in the art of converting the skins of aquatic creatures into leathers of excellent grades is that now being pursued upon a commercial scale in dealing with the hides of sharks, rays, dogfish, blackfish, etc. Despite the fact that many firms, encouraged by the United States Department of Commerce, failed to secure satisfactory results, one New York concern has solved the difficulty that has hitherto baffled the tanner. One of the early operations in preparing the skin of the aquatic animal for tanning is that of soaking the hide in lime solution. If this is not done with extreme care and with due regard to the natural differences peculiar to the fish skin the resultant product is so spongy and lacking in strength that it has practically no market value. This stage of the process has pretty generally ruined the skin and made further work upon it quite useless. To-day, the secret of a correct lime bath has been

discovered, and, similarly, some other phases incidental to the manipulation of the skins have been mastered. Among these is a degreasing treatment which effectually removes the fishy odor.

The adaptation of the shark skin to the general purposes of the leather worker has presented distinctive difficulties—so, too, has the skin of the ray and the dogfish—because of the horny, tuberculous exterior which is frequently so hard that it can be ground down only by means of abrasive belts or wheels. In fact, this shagreen has been extensively employed by cabinet-makers, ivory workers, metal workers, etc., in lieu of emery cloth and sand paper. The question of making shark skins available for leather has, therefore, rested in part upon divising ways to get rid of the shagreen. The results as a rule have been anything but satisfactory, simply because grinding away what might be called the superficial hard material still left the supporting parts or bonds imbedded in the leather, to just that extent stiffening it, greatly hampering cutting and sewing, and yielding a product which had numerous drawbacks.

Thanks to recourse to chemistry, the shagreen can be completely separated from the underlying skin and yet leave the hide beautifully marked with its characteristic "grain." So dressed, the leather lends itself to the manufacture of bags, belts, card cases and other articles where an ornamental surface is desired. With this exterior removed, either the upper layer of the skin or the underlying "splits" can be dressed for shoe stock—including the heavy material for soles. The leather will take a beautiful finish and is notably durable. From a 500-pound shark it is possible to obtain ten square feet of leather from the hide, and the stomach furnishes a raw material that will yield a leather which is soft and strong and looks not unlike glazed kid when ready for the market.

The ray or devil fish will frequently provide a skin, when tanned, having an area of 100 square feet; and the sawfish is also a potentially abundant source of leather stock. The dogfish, being comparatively small, is not as individually profitable as the full-grown shark, and yet its hide is well worth tanning. The porpoise, depending upon its size, will give a skin susceptible of producing anywhere from 10 to 20-odd square feet of leather. Not only that, but from this skin can be taken a sturdy upper layer of grain of very fine quality and then two underlying "splits"—the first of these being thick and strong enough for a good grade of heavy shoes, while the second "split" is of the character of a thick suede. The intestines of the porpoise make leathers for which there are many uses. The skin of the blackfish and likewise the skin and stomach of the whale lend themselves to tanning, and from these several sources leathers of fine qualities can be secured.

UTILIZATION OF OTHER PARTS.

But this whole question of "sea leathers" would make but a moderate appeal to enterprise and capital if it were not possible to utilize other parts of these aquatic creatures. From the livers of the shark an oil is obtainable, also from the livers of the dogfish, which is said to have much of the medicinal properties which characterize cod liver oil, and, besides, the oil is in demand for the manufacture of soaps, for mixing paints, and for the treatment of some leathers. A 500-pound shark will give an average of from 10 to 15 gallons of liver oil, which is easily marketable at fifty cents a gallon. The dorsal fins, when dried, bring \$2.50 apiece among Oriental epicures. The teeth sell readily for five cents each to manufacturing jewelers who work them into ornaments of one kind or another. The flesh of the shark is said to be decidedly palatable, and the Bureau of Fisheries has published some thirty different recipes for fresh shark, smoked shark, salt

shark, and canned shark. In common with the meat of other sea creatures, the flesh of the shark can be converted into fertilizer or dried and ground chicken and cattle food. As a fertilizer the stuff is rich in ammonia and phosphoric acid. Sharks in our southern waters range from 400 pounds to 2,000 pounds in weight, while the devil fish or ray will frequently tip the scales at 3,000 pounds.

PORPOISE YIELDS OIL.

The porpoise, besides furnishing skins that can be tanned, yields three grades of oil—i.e., body, head, and jaw-pan. The latter is especially valuable as a lubricant for watches and other fine mechanisms and, to-day, fetches quite \$50 a gallon. Certain parts of the skins of some of these aquatic animals—parts that are not worth tanning—contain fully 90 per cent of glue. Likewise, from the blood of some of these creatures is to be had the basic material for a superior kind of waterproof glue such, for instance, as is desired in the built-up stock now used in making airplane propellers and other wooden parts of the flying machine. From the intestines that cannot be worked into leather it is possible to get the gut for string instruments, tennis rackets, etc., and sausage casings, parchment, stopper-covers, glue, and other marketable commodities. The point is, nothing need go to waste; and, at the same time, an inexhaustible source of leather stock is thus made available which heretofore has been almost entirely neglected.

ECONOMICS IN THE WEST.

Industrial Situation.

London, 21st September, 1919.—Since the despatch of my last letter there has been a marked improvement in the industrial situation. There are still ominous rumblings and mutterings in the Labour world accompanied by such occasional outbreaks as occurred at the Trade Union Congress at Glasgow where a vote was given in favour, nominally at all events, of that form of revolutionary action which masquerades under the name of "direct action." But the voice of reason is being increasingly heard in Labour circles. Men like Mr. Clynes, the late Food Controller, Mr. Havelock Wilson of the Seamen's and Firemen's Union and Mr. Brownlie of the Amalgamated Society of Engineers are standing out courageously against the subversive doctrine which if carried into effect would Bolshevise British industry. They see clearly, as others do, that any attempt to overawe the Government by a general strike would recoil with disastrous consequences to the promoters. As Mr. Clynes pointed out in a singularly convincing speech the men who are most prominent in clamouring for the adoption of extreme measures were precisely those who were worst defeated at the polls at the General Election. The truth is that the country is set resolutely opposed to the principles which these men represent. The feeling against them has strengthened rather than weakened of late. The nation needs repose and it will make short work with those who seek to create a sort of Civil War.

LORD FISHER'S REMINISCENCES.

Lord Fisher's breezy reminiscences which are being published in the *Times* are of exceptional interest from many points of view and not least from the light they throw

on future developments which will profoundly influence industry. The distinguished writer lays especial emphasis on the future predominance of the internal combustion engine with its almost inimitable corollary the use of oil instead of coal as a source of power. He is so convinced of the effectiveness of the new type of engine that he foresees a time not far distant when all the ships of the navy will be driven by this agency. He is naturally concerned in the main with the nation's chief fighting arm, but if his theories are sound the internal combustion engine will be used largely in the mercantile marine and for industrial purposes. His views have not escaped severe criticism at the hands of professional engineers, who have not been slow to point out the present limitations of the new agency. But in the main he is probably correct. Though it is true that the internal combustion engine has yet to reveal its adaptability to the purposes of large ships, it is evident from the success that has so far attended its employment that the principle is sound and only needs to be developed on proper lines to assert the same superiority over the older type of engine that the turbine has done.

BRITISH ANILINE DYE.

So many contradictory reports have been circulated as to the British aniline dye industry which is one of the products of the war period, that it is satisfactory to have a definite statement showing that real progress has been made. The authority is the head of a leading firm of Yorkshire chemical manufacturers who has been closely identified with the pioneer work undertaken to establish the new industry. This gentleman asserts that British firms will not only be able to compete favourably with German dyes sent into this country but they will also prove formidable rivals for the trade in other countries. Up to the present, he states, British firms have not attempted to make every dye the Germans made, for this was

a practical impossibility seeing that the Germans with 30 or 40 years experience behind them, sent from 800 to 1,000 different colours over to England. But by tackling the principal colours, those for which there is, and will be, the greatest demand and which can be turned out from an economic point of view, they have accomplished a great deal. Moreover, the time is not far distant when British manufacturers will be able to produce any dye that Germany made before the war. Even now a wonderful export trade is being done in British dyes, a thing unheard of before the war. Especially is this the case in regard to a dye known as nigrosine black used for leather, the monopoly of which was formerly held by Germany. It is, of course, yet too early to speak of the permanence of the progress that has been made. We have yet to hear from reconstructed Germany and her reply to the British challenge to her old dye supremacy may be very effective. But at least it may be said that the British dye maker has established a position in the home market from which he cannot be displaced under the conditions which the Government have arranged for the protection of the industry from unfair competition.

INDUSTRIAL WAR WORK.

Now that the fog of war has lifted we are getting some interesting glimpses into the working of the tremendous industrial machine which the Government created for war purposes. An illustrated booklet just issued, for example, tells us what was done by the great engineering firm of Armstrong, Whitworth & Co., and a wonderful story it is. We gather from it that more than 13,000 guns and carriages were completed, the sizes ranging from 6 pounder tank guns to 18 in. naval guns weighing 152 tons each. The total number of war vessels built was 47, while 62 warships, including nine Dreadnoughts were fitted with armament. For the submarine fleets 970 torpedo tubes were

provided and aeroplanes and tanks were also made in great numbers. But the most remarkable achievement of the Elswick works was in the provision of ammunition. The total number of shells turned out was 14,500,000. In addition fuses were made to the number of 18,500,000, and there were also supplied 21,000,000 cartridge cases, 4,400,000 lyddite block charges and 3,000,000 filled shells. Imagination is staggered by these figures. Also, perhaps, the mind is saddened by the record of the production of this huge body of elements of destructiveness. It is, however, some consolation to know that the splendid enterprise which made this possible is now being devoted to the productions of peace with some assurance that the ultimate results will be equally brilliant.

SOME OTHER REVELATIONS.

At the British Association gathering at Bournemouth this week there have been other instructive revelations of the achievements of British science and industry in the war. Perhaps the most arresting statements were those contained in the opening address of the President, Sir Charles Parsons, where he contrasted the energy expended in the past mighty conflict with other wars. He showed that while at the battle of Waterloo the total weight fired by the artillery was only 37.3 tons and that in the whole of the South African war the artillery ammunition fired did not exceed 2,800 tons, in a single day on the Western front the British guns expended 18,080 tons of ammunition, while during the whole war in France alone British guns discharged nearly three and a half million tons weight of metal. Less appalling and infinitely more encouraging were the details given relative to the various devices employed in the war as an aid to our offensive and defensive agencies. Highly instructive was the story of how by a careful scientific examination of the structure of the ear of a whale the scientists devised a sound instrument which enabled

our criusers to detect the presence of submarines. Another device which the Germans were the first to use was an insulated cable laid along the bed of the sea which enabled ships to work in and out of mine fields without risk. The public were also told of an ingenious system of sound ranging by means of which it was possible to locate within fifty yards enemy guns which were firing nearly a mile and half away. It is obvious that these inventions will have their usefulness in days of peace as in war. For example, how valuable will be the insulated cable to vessels finding their way out of a harbour or through a dangerous channel at night or in thick weather? Sir Charles Parsons, who it is scarcely necessary to remind my readers, was the inventor of the turbine, though he made no reference to the internal combustion engine had a good deal to say about the future sources of power. He expressed the view that as in the past so in the future England would have to depend upon her coal supplies for her heat and source of energy. Discussing water-power, he pointed out that the average capital required to produce electrical power from coal is less than half the amount that is required in the case of water-power, though the running costs are much less in the latter instance. He added the interesting calculation that if all the water-power of the world were harnessed, the cost would amount to about 8,000 millions—about the total of the British war charges. Looking into the future, Sir Charles foreshadowed the possibility of developing molecular energy and suggested the driving of a shaft twelve miles deep to ascertain whether means of power might not be derived from the earth's interior. As an encouragement to such enterprise he mentioned that in Italy bore holes had been sunk which discharged large volumes of steam, a force which was used to drive 10,000 horse power turbine engines. As the twelve mile bore hole would cost £ 5,000,000 to sink and would occupy 85

years in the sinking, it can hardly be regarded as a practicable proposition. But there can be no question that in the hidden forces of the earth's interior are vast possibilities.

Margarine in the past few years has been for home staying people almost as blessed a word as was Mesopotamia to the old lady of Evangelical leanings. At the British Association meeting Professor Halliburton let the public into the secret of how Britain had made herself largely self-supporting in regard to this product. He also had a good deal that was interesting to say about the dietetic character of margarine. He, after pointing out that the perfect fat is one which must contain an elusive element known as vitamine, went on to say that no purely vegetable oil contained this element. Hence it follows that margarine to be really nourishing must contain some admixture of animal fat. The vegetarians have yet to be heard in regard to this theory and in the meantime probably the bulk of people will share the pronounced preference which Professor Halliburton expressed for butter over margarine. This preference will most likely be strengthened by some revelations he made as to successful experiments made in the conversion of castor oil into margarine. Visions will arise when the daily fat of butter substitute figures on the table of matutinal doses of oil and fancy will detect the familiar smell of the potion in the yellow material of the breakfast table. However, judged from the standpoint of public interest it is a great thing to have manipulated castor oil in this fashion. The Government have immense stocks of the oil and in the new conditions they will be able to dispose of them to the best advantage. Another aspect of the matter which deserves consideration is the fillip that this new development of the margarine industry is likely to give to castor oil production. For a long time past cocoanut oil has been at a premium largely because of its increasing use in the process of soap, candle and margarine

manufacture. Castor oil is almost certain to undergo a similar appreciation in value. Therefore cultivators of suitable lands for the plant cannot do better than give their serious attention to its introduction into their agricultural programme if they have not already grown it.

To continue this record of war reminiscences, I may draw attention to a paper read by Dr. E. J. Russell on fertilisers for the land which is worthy of notice in the columns of a journal such as this. Dr. Russell after emphasising the growing importance of artificial fertilisers in the economy of agriculture, stated that many experiments had been made with regard to the utilisation of surplus explosives left in hand at the date of the Armistice. The agricultural problem in respect to nitrate of ammonia had been satisfactorily solved, and that substance could now safely be used. A method had also been devised for making fertiliser out of cordite. Further, there was considerable hope of greater use of sewage as a fertiliser. In India there are obvious objections to the use of sewage, but there as elsewhere in the Empire there must be a good deal of surplus cordite and nitrate of ammonia which the authorities could turn over to Agricultural Societies for experimental use. Unquestionably it is in such experimental measures that the chief hope lies of a permanent improvement of Indian agriculture.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

The Story of the Great Amoskeag Mills.

Washington, D.C., U.S.A., Aug. 19, 19.—

On the banks of the far-famed Merrimac River, at Manchester, New Hampshire, are located the largest textile mills in the world. These mills are noted for many reasons: they are famous not alone for size, covering an immense stretch of territory, and output, which is known the world over, but also for an almost perfect system of welfare work, by which an army of workers are made and kept happy and contented.

Each employe, from bobbin boy to boss, reports every day at six o'clock, and from the day the whistle blows until quitting time these vast mills are in constant operation—a literal hive of industry. Thus it has been, six days in the week, ever since 1831 eighty-eight years without intermission, strike, tie-up or labor trouble.

Not alone do the mills cover many acres, but the homes of the workers, to the number of 834 separate neat brick buildings with grounds around each, spread out over a vast amount of ground.

The married men of family have the first choice in renting these homes, and they are also permitted to buy the home if they desire to do so. Some arrange to pay off a mortgage placed by the mill in the form of rental. This is done to keep the worker in the territory controlled by the mill and contiguous to it. A small rental is charged those who do not care to purchase—barely enough to pay the expense of upkeep of the property, the housing proposition not being a money-making venture in any sense.

The Amoskeag Mills have many notable innovations, but chief among them is the "housekeeping flying squadron." It works

in this way: Suppose one of the workers finds his wife and helpmate ill and several small children to be taken care of. Does he stay at home from his work to nurse and attend his sick family? No. He simply communicates with the "service department" of the mills, and at once a competent house-keeper is sent to his home to care for those unable to care for themselves until they recover and everything is normal again. Not an hour is lost by the head of the family. In addition to this a staff of physicians is constantly available and always in attendance.

The Amoskeag Mills employ 8,500 men and 7,000 women—a total working force of 15,500 people, with a weekly payroll averaging close to \$300,000. The mill proper and its various outbuildings cover over 137 acres and have a floor space of 6,844,340 square feet. Nearly 400,000 yards of cloth of various kinds and 395,000,000 yards of cotton textiles, ginghams, etc., are woven in the average working year.

Since the Amoskeag Mills were incorporated, in 1831, almost \$260,000,000 has been paid out to its employes in wages and bonuses.

The writer has just returned from a visit to the mills, the trip serving as a vacation period. While inspecting the great plant he asked the superintendent—a man grown old in the service of the mills, but still having a joyous heart and an upward look—"What has been the chief cause for your absence of labor troubles and the very evident content and happiness of this army of people?"

"We have succeeded," he replied, "because we have always and under all circumstances treated our help right, we have always tried to keep the point of view that they were a part—and a very essential part—of the enterprise. We have encouraged a spirit of thrift among our people, and have gone to great lengths to make our employes feel that we do not lose interest in them

when the whistle blows. It's pretty hard to make a malcontent or a disturber out of a man whom we have helped to own his own home. We are located, as you see, in a small town, comparatively speaking, but since our establishment in 1831 we have been entirely free from labor troubles of any kind. When any employe, man or women, has a grievance, real or fancied, he or she knows that the boss's door is always open and they are encouraged to come direct to head-quarters, and we are ready to go a little more than half way in straightening the matter out. Our payroll has increased substantially every year. We have never reduced an employe's pay, and we want our employes to earn over and above their salaries all that it is possible for them to make. There is no limit. With that object in view we have installed a liberal system of bonus payments which works out in a very equitable way."

EMPLOYEES' INSURANCE.

An interesting and popular industrial feature of many of the larger business and manufacturing establishments of the United States is the plan of employes' insurance, by which, according to the term of service of the worker, each employe of an establishment who has been in its employ for over six months is guaranteed a certain amount of insurance in the event of his death. The minimum amount in one large establishment is \$300 and the maximum amount is \$1,000.

One of the manufacturing concerns which have brought the plan to a practical success is the Karpen Furniture Co., of Chicago, the largest furniture manufacturers in the country. The big organization has been particularly happy in its relations with its employes, many of them having been in the service of the company for thirty and forty years. Efficient and faithful workers seldom leave the Kerpen service. It is partly a reward for faithful service in the past as well as a recognition of the spirit of the times which

tends more and more toward co-operation between employer and employed that the big Karpen organization has adopted the new insurance policy.

The firm believes that bolshevistic and radical tendencies are best combated by friendly understandings and the assurance of the employe that in the event of death those dependent on him will, at least in some measure, be provided for. The Karpen organization provides for relief in case of the worker's illness or incapacitation. The new feature has been enthusiastically and gratefully received by the big army of employes. The following is the plan in detail as furnished each employe. To our Employes:

We desire to announce that we have secured a contract from the Aetna Life Insurance Company, of Hartford, Conn., whereby the employes of our company are protected with a life insurance policy during their term of employment with the company in case of death from any cause, at any time or place.

This protection is provided: First—Because we wish to encourage every one in his common duty of providing for those who are dependent upon them. Second—Because we wish to help you free your mind from worry caused by dependents unprotected in case of your death. Third—Because we wish to encourage every one to steady work and loyal co-operation.

The amount of insurance upon your life is graded according to your term of service and from the following table you can easily figure out just how much insurance you are entitled to at this date:

Less than six months' service—No Insurance.

Six months to one year continuous service	...	...	\$ 300
One year to two years continuous service	...	...	\$ 500
Two years to three years continuous service	...	...	\$ 600

Three years to four years continuous service	...	...	\$ 700
Four years to five years continuous service	...	...	\$ 800
Five years to six years continuous service	...	...	\$ 900
Six years and over continuous service	...	...	\$ 1,000

As you complete each continuous period of service your immence will begin or be automatically increased to correspond with the above table.

This action has been taken as a means of expressing our appreciation, in a substantial form, of the value we place upon the loyal co-operation of our employes and as a means of our providing for those dependent upon you immediately at the time of your death, at which time they may need it most. The insurance is paid for by S. Karpen & Bros. It costs you nothing while you remain in our employ. This insurance is in addition to any payments provided for by the Workmen's Compensation Act or sick benefits to members of the Carpen Mutual Benefit Association.

We trust that you will accept your certificate as an expression of our sincere appreciation of your work, and we hope that your association with us may be productive of mutual benefit.

TICKLISH TUNNELING UNDER THE EAST RIVER.

A very interesting bit of tunneling has just been completed on the great Fourteenth Street tube under the East River, New York City. The heading was being run in rock, and at several points testing holes showed a thickness of only eight inches of sound dry rock above the line along which the top of the tunnel was to run. As the tunnel was being driven without the use of compressed air—which has been used in nearly all of the tunneling operations around New York—it was decided to drop the upper heading four feet until this thin cover of rock was passed. The cast iron lining was set in place at each

side of this section, and then the rock was removed very carefully by using a great many holes each loaded with about one-eighth of a stick of dynamite. As each bit of rock was removed to the arch the tunnel lining was set in place. By this means the dangerous section was tunneled without breaking through the thin shell.

SIMPLIFYING AUTOMOBILE REPAIRS.

Automobile repairing following a collision or other accident is receiving largely increased attention in all parts of the United States.

One of the most common repairs to an automobile frame is straightening a spring horn or "dumb iron" in the event of a collision. A very simple and effective method of performing this work has just been devised, providing that the frame is bent forward of the radiator support and that the shock has not cracked or materially injured the metal. If the frame side is cracked it will be well to straighten it to its original form and then fill in the cracks with new steel by the oxy-acetylene process. If the frame is merely bent straightening it to its original form will be all that is necessary to effect a permanent repair. The radiator should be removed as well as the front axle and the springs. The front of the machine is supported by blocking under the frame members or by any suitable stand. The body should be raised from the chassis about four inches at the front end so that a loop of chain can be passed around the frame member to act as an anchorage for a piece of joist used in straightening the side members.

A piece of sheet steel is placed under the frame and supported by the box, the top of which has been covered with about three inches of sand. A rough furnace may be constructed of fire brick and the frame covered with charcoal, a slab of firebrick serving to keep the heat confined to the bent portion of the frame. A large gasoline blow torch is employed in connection with the

burning charcoal and sufficient heat is applied to bring the frame side to a cherry red heat for several inches on each side of the bend. The torch is then set aside, and while one man carefully manipulates the jack, which is best placed against a piece of board resting on the frame member at the point where the engine support is bolted or where a cross-brace is rivetted, an assistant facilitates the work by hammering and contouring the heated section to bring it back into shape. A blacksmith's "flatter" should be interposed between hammer and frame in order not to dent the frame side, as might be done if the hammer blows were directed against the heated members. The straightening can be done only while the frame member is hot enough to show color, and as soon as the redness is lost the torch must be again applied to heat the bent section before any further work can be done. A block of wood may be interposed between the frame channel so that the chain or bar-loop at either end of the beam does not crush in the metal where pressure is applied.

A UNIQUE FOREST TELEPHONE.

A forest "ranger" walking through a western United States forest smelled smoke. He investigated. Presently, just ahead of him he saw thin smoke clouds arising. A fire! An American forest fire is a matter not to be trifled with. He rushed to the nearest telephone line, attached his portable telephone and rang. No answer. Again, and still no response. The men at the station had walked off and did not hear the bell. In the ranger's telephone there was a Klaxon horn. He quickly connected it up and started it whirring and buzzing. The noise echoed and re-echoed through the forest, and in a few moments came over the wire. Fire-fighting help was quickly sent and the fire was put out before it had gained any considerable headway.

This combination telephone and signal horn is the invention of the United States

Forestry Service. It is made so compactly that it fits snugly in a box which the ranger can carry with ease. On the bottom shelf of the box there are six cells of dry batteries which furnish the power. On a top shelf of the box are found the transmitter and the receiver and on the middle shelf the Klaxon horn, which makes a terrific horn when in action. A special magneto furnishes either a direct or an alternating current. The alternating current is used for the ordinary ringing signal, and the direct current is used for operating the Klaxon horn. The box containing the entire outfit weighs less than thirty pounds and can be carried about conveniently.

SINKING CAISSONS IN SHIFTING GROUND.

There is an electric light and power plant about 200 feet from the Patapsco River, near Baltimore, Maryland. A cable way carries the coal from the river to the power house, and coal is also stored in the space between the power house and the river bank. Recently the company started the erection of a new hoisting tower and bridge to handle coal, but the weight of the coal stored had started a movement of the ground toward the river, and it was realized that the construction of the tower foundation in this shifting ground would be carried on with difficulty. It was decided to sink caissons at an angle so as to allow for the movement of the ground, and this was done by suspending the caissons from a timber framework by means of cables. By letting out certain cables faster than others the desired tilt was obtained. After the caissons had been carried down through the shifting soil (a distance of over fifty feet) they were brought to exact plumb and the excavation proceeded under air through a twenty-foot layer of sand until hard bottom was reached.

ALFRED T. MARKS.

NOTES.

The Administration Report of the Dhrangadhra State (Bombay Presidency) for the year ending the 31st March, 1919, says:—The industrial resources of the State are not at present great but their possibilities are very considerable. Dhrangadhra stone has for long been famous in Western India and a great stimulus to the quarrying of it has been given by the reduction of the Royalty on it and by the opening, in 1915, of a railway quarry-siding. It is confidently hoped that the transfer of the management of the State Railway to the Bombay, Baroda and Central India Railway, which is shortly to be effected, will result in the further development of the stone industry and traffic. The manufacture of Magnesium Chloride, Glauber, and Epsom Salt, on a large scale, however, still forms the subject of correspondence between the Government and the Durbar. As has been shown in previous reports, the State is most favourably situated for the manufacture of these and other products of salt required by the textile and other industries in India. The necessity for manufacturing these chemicals in India has been emphasised by the Report of the Indian Industrial Commission which shows that, though improvement has been effected under war conditions, much still remains to be done before the possibilities of these important products are exhausted. It has long been the ambition of Dhrangadhra State to obtain sanction to a scheme by which some of India's many deficiencies in chemicals may be remedied. The extent and gravity of those and other deficiencies of a like kind constitute, to quote the Industrial Commission, "a serious national danger," and Dhrangadhra only awaits the sanction of Government in order to develop its salt industry so as to help in removing that danger and to benefit the State as well as Indian industries. * * * The State is desirous

of securing to the Empire the benefits of the peace which has happily been attained; and in the development of its salt industry it very clearly sees the opportunity not only of helping to free India from the necessity of relying on foreign imports—and in this particular case of imports from Germany—but of playing a not unworthy part in the industrial renaissance of the country.

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The question of the possibility of manufacturing paper in Ceylon has been considered by the Industries Commission, but it is understood that so far no extensive experiments have been carried out with a view to discovering which trees give the best pulp and whether such trees exist in sufficiently large numbers, and are sufficiently concentrated in particular areas, to render the local manufacture of paper a paying industry. Almost any soft wood is suitable for the production of pulp, but one of the chief difficulties in Ceylon would appear to be, that most of the trees with soft wood grow principally in the wet zones where the land is already largely under rubber or some other product. The bamboo tree gives a pulp suitable for the manufacture of paper and, as a matter of fact, is extensively used for this purpose in India, the West Indies and elsewhere. But it is doubtful whether the bamboo exists in sufficiently large numbers in Ceylon to make the local manufacture of paper from this source a practical proposition. Writing in this connection the *Times of Ceylon* states that it is believed that there is a possibility that pulp suitable for paper-making could be produced here, compressed, and exported to India or elsewhere for conversion into paper. It is said that the manufacture of the finished paper product, though possible in the Island, presents considerable difficulties.

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A special committee of the Institution of Electrical Engineers of Great Britain has

been formed to consider the revision of the existing rules for electric wiring in buildings. This committee is the outcome of a growing conviction that the high quality of British cables and accessories justifies a relaxation of the standards hitherto imposed. During the war an enormous number of army buildings have been wired on the surface and in other ways not consistent with standard British practice; and the experience thus gained will be turned to account in cheapening the cost of installation and materials. British manufacturers of wires, switches, insulators and other accessories will thus be led to expand the production of types which will be peculiarly adapted to meet the needs of overseas markets. Satisfactory quality will be ensured by the National Electric Proving House which is about to be established in Great Britain, and which, as it were, will put the hall-mark of good design, material, and workmanship on every class of electrical apparatus, thus giving British productions the full benefit of the high reputation they have always held.

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We gather the following information regarding the several industrial concerns in the State of Baroda from its Administration Report for 1917-18. The Vaso Dyeing and Bleaching Factory was sent into liquidation, but the machinery was purchased by one Mr. Patel who has also purchased the building of the old leather factory where he proposes to set up the machinery. The Chemical Works at Navsari have changed hands, and the new proprietor, Mr. Randelia is making arrangements to continue the works. The application from a merchant of Damnagar for a lease of the Charakla creek in Okhamandal for the manufacture of alkali and other chemical products from brine and salt is still before Government, as the question of giving a monopoly requires careful consideration. A joint-stock company for the manufacture of Mangalore pattern

tiles has been started and the work of constructing the factory begun. Three other smaller factories for manufacturing similar tiles have also started work at Bilimora and Navsari. The manufacture of flooring tiles and terracotta has been undertaken by another concern on a small scale at Gandevi. In response to an application for a loan, two lakhs of rupees were sanctioned for the Shri Sayali Cotton and Jute Mills Co., Ltd., Sidhpur, for the extension of their factory.

A Government of India Press Communique says:—Since the provisions of the Cotton Cloth Act were formally put into operation in February last, there have been no violent fluctuations in the price of cloth, the trend of which over the whole period has been in a downward direction. During the last few weeks prices have risen in Bombay, mainly as a result of increased demand due to the favourable monsoon conditions, but indications point to an approach to a level which may be regarded as normal in post-war conditions. In these circumstances and in view of the fact that, as stated in a reply to a question asked by the Honourable Maharaja Sir Manindra Chendra Nandi in the Imperial Legislative Council on September 25th, the Governments of the United Provinces and Bihar and Orissa, in which the shortage of cloth was originally most acute, have still large stocks of standard cloth on hand and that arrangements has been made by the Controller of Cotton Cloth to ensure a supply of standard cloth to the Punjab and Assam where there is still a demand for it, the Government of India have decided that Cotton Cloth Control should be placed in abeyance for the present. The Cotton Cloth Act will, however, remain in force and the provisions will again be put into operation should speculation in cloth or any other cause force prices up to such a point as to render this desirable. Mr. F. Noyes, I.C.S., Controller of Cotton Cloth, has joined the Indian Sugar Committee as Vice-President.

but will remain in charge of the work connected with Cloth Control until it is finally wound up at the end of November. A full report on the operations will be published shortly.

The Madras Government have sanctioned a sum of over two lakhs of rupees for the construction of the buildings for a cattle breeding station at Chintaladevi in the Nellore district. The station is situated in the tract which produces the Ongole breed of cattle. The importance of this breed to the Presidency is well-known. Most of the better class milch cows in Madras and indeed in the greater part of the Tamil country have been bred in this tract and the Dutch and American Governments send their agents to Nellore to buy Ongole cattle to improve the breed in Java and the Philippines. Of late years there has been a complaint that the cattle-breeders have been tempted by the high prices to export the best of their stock and that the breed is consequently deteriorating. The object of the breeding station now to be established is to ensure the maintenance and improvement of the breed without interference with the profits which accrue to the ryot from the export trade. About 850 acres of land have been set apart for the breeding station; part of this area is commanded by the new Hopad reservoir and there will therefore be no difficulty in maintaining the stock even in years of drought. It is intended ultimately to maintain a herd large enough to enable the Agricultural Department to send out 40 first class bulls each year; these will be disposed of in the manner which seems best calculated to improve the breed throughout this breeding tract while a fair revenue may also be expected from the annual sales of superfluous and low grade stock.

The prohibition on the export of oils and oil seeds from India was removed with effect from sixth December.

GLEANINGS.

Vigorous efforts were made at the beginning of last year to increase the capacity of the Japanese mills, but the difficulty of obtaining the necessary machinery from England hampered the plans of the manufacturers to a great extent. Still, in spite of all hindrances, the Japanese managed to do a great amount of trade with India. The total exports to India from Japan managed to do a great amount of trade with India. The total exports to India from Japan last year reached a total value of £22,404,000 compared with a little over £3,000,000 in the year before the war. The Foreign Trade Board's figures show that the total value of the cotton fabrics exported from Japan last year was, including the exports to China, £23,800,000.

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It is stated that the question of utilising the abundant supplies of dye-producing woods found in Ceylon is just now engaging the attention of the authorities. One of the chief dye producing wood is the Japan wood, which has recently been exported from Ceylon in large quantities. During the war, when German dyes were no longer available large quantities were exported from Ceylon to India and Japan.

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Mr. Montagu, Secretary of State for India, replying to Sir J. Rees, said:—Subject to the settlement of some important matters of detail the Government of India have been authorised to proceed with legislation for enabling the three Presidency banks to the amalgamated. It is contemplated that under the proposed scheme the amalgamated bank would be the custodian of the Government balances in India, and would undertake to open 100 new branches in five years.

To-day between 5,000,000 and 6,000,000 motor vehicles use American highways, according to *Motor Travel*. Ten per cent of these vehicles are motor trucks. Instead of constituting practically 100 per cent of the traffic as in 1903, horse-drawn vehicles at present amount only to 5 to 20 per cent of the total number of vehicles on highways outside.

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A new soap for the use of cotton mills known as Luopon Soap is being placed on the market by a Manchester firm. The makers claim that exposure to the atmosphere does not deteriorate the product, whereas many products of this type previously manufactured lose from 10 to 30 per cent of their most valuable properties in the course of a few hours if left in an open vessel. Therefore, Luopon soap keeps better and gives more even results when used out of the cask, the last portion being equal to the first portion. In the dyeing of cotton, it is applied by the addition of $\frac{1}{2}$ to 1 per cent of the product to the dyebath so as to ensure a more rapid soaking and a better penetration of the goods. In many cases the shades become deeper and brighter, and the goods have imparted to them a soft, full handle. In the bleaching of cotton the addition of $\frac{1}{2}$ to 1 per cent of this soap to the caustic boiling-out liquor greatly helps in producing an even bleach on both yarns and pieces. The product is also of service as a constituent of many finishing mediums for various purposes. It is claimed to increase the stability of the finish by precluding the formation of mildew.

SPEECHES AND PRONOUNCEMENTS.

THE INDIAN SUGAR COMMITTEE AIMS AND OBJECTS.

In opening the Cawnpore session of the Indian Sugar Committee, Mr. James Mac Kenna, C.I.E., I.C.S., Agricultural Adviser to the Government of India and the President of the Committee, said :—

Now that the full committee is assembled, I think it desirable that some general statement of the aims and objects of the Indian Sugar Committee should be made, in order to correct certain misapprehensions, which appear to prevail regarding the scope of its enquiries. One had hoped that the labours of the Indian Cotton Committee would have convinced the public that the method of investigation by a committee can be applied with some measure of success to any agricultural question, or even to any particular agricultural crop. The questions that one has to meet are, what are you going to make the cultivator grow—more sugar-cane? Similar questions were addressed to us when we started the cotton enquiry. We are not going to force the cultivator to do anything that he does not want to do. But we propose to investigate the problem of sugar in India in its broadest aspects, to see whether the present methods of cultivation cannot be improved so that the cultivator will get a larger yield from the plot of cane, which he at present cultivates, and also to ascertain whether by an improvement in his manufacturing processes, he cannot get a better outturn of sugar or *gur* from his cane.

The Empire is crying for sugar. Only a day or two ago a *Reuter* telegram appeared in the papers, which stated that the Royal Commission on Sugar Supply has announced that the world supply of sugar is insufficient to meet the demand, and that, accordingly, the retail price of sugar will be increased one penny per pound from the 3rd of November with a view to economising consumption. The quantity of sugar, which can be imported into the United Kingdom in 1920 will be at least half-a-million tons less than in 1919. If, therefore, India can become, as she was in the past, self-contained as regards sugar, her present large imports might be utilised by other parts of the Empire. It is even possible that in the future she may again become an exporting, instead of an importing, country. Our labours are, therefore, directed in the first instance to ascertaining whether it is not possible to improve the position of the existing cane grower by bringing to his aid methods of cultivation or of manufacture which have been found to give better results than

the primitive ones which he has followed from time immemorial. It will also be our duty to investigate the probable effect of the introduction of any schemes of irrigation, both as regards existing areas under sugar-cane and areas likely to be brought under sugar-cane as a result of the provision of these facilities, care being taken that the economic balance between sugar-cane and food crops is not unnecessarily distributed. But, apart from the existing areas under sugar-cane, there are vast tracts of unoccupied waste land in India, which we venture to believe could with advantage be placed under sugar-cane cultivation. In such cases it will be for consideration whether the best line of development lies in the direction of central factories or in the encouragement of small local manufacturers. If the former, we shall have to decide whether it is preferable to recommend large grants of land for central factories, which will be worked either by a system of tenancy or by hired labour. A reference to the financial papers of Bombay and Calcutta indicates that there is a vast amount of Indian and European capital awaiting investment, and the prospectuses of companies also reveal the fact that Indian and European capital is coming into closer relationship than has been the case in the past. It will be noticed that on nearly every Board of Directors, Indian and European firms are represented. But, in dealing with the proposition on this larger scale, the committee will not lose sight of the economic and social welfare of the actual cultivator, and such questions as co-operation or profit-sharing will be brought under investigation.

I wish it to be distinctly understood that it is not our intention to bring any pressure to bear on the cultivator if he does not desire to undertake cane cultivation but, if we can show that cane cultivation is profitable, and if it does not compete with other more essential food crops, I venture to hope that the results of our deliberations will be to induce him to consider the desirability of taking it up. As I have said before, we hope as a result of our enquiries to recommend methods of cultivation and of manufacture which will pay better than those now followed. Incidentally, we shall have to consider what additions to the existing Agricultural Departments are necessary to give effect to our agricultural recommendations. It will also be our duty to consider to what extent, if any, the imposition of a protective tariff is desirable, if not permanently at least until the industry has been placed on a sound footing. We fully realise that owing to the force of local sentiment in favour of hand-made sugar its manufacture must continue to exist, but we hope it will not be found impossible to make recommendations which will place it on a sounder footing. With the devolution to the provinces of agricultural policy, which is inevitable as a result of the Reform Scheme, we hope to be able to lay down for sugar, as the Indian Cotton Committee did for cotton, a general policy for the whole of India, which the provinces, we venture to hope, will adopt with such modifications as local conditions may necessitate. Whatever devolution there may be India will always think imperially, and Provincial Governments will loyally support any general lines of policy which are likely to contribute to the imperial gain. That is why it is desirable that the sugar position should be reviewed from a wide standpoint, *i.e.*, from the All-India point of view.

TOPICS FROM ECONOMIC PERIODICALS.

SOAPS FOR COTTON GOODS.

We take the following from *Pascall's Textile Journal* :—

The fibres in cotton and linen goods contain very much less impurity than wool and silk fibres and consequently the amount of soap used in this industry is much less, being applied only to the fabric. It is employed in three different operations: cleansing the cotton goods preparatory to dyeing, during and after dyeing, and in calico printing.

Since dilute caustic alkali has no harmful action upon the cotton fibre, the soap used in cleansing and preparing cotton goods for dyeing need not be neutral; in fact, slight alkalinity assists the cleansing. Any curd soap made from tallow, or tallow with a small proportion of cocoanut oil, may be used for the purpose.

DYERS' SOAPS.

Soap is used to a fairly considerable extent in the dyeing of cotton goods. In the dyeing of many direct colors soap is frequently used to the extent of 3 to 3½ lb. per cwt. of cotton which is dyed.

• The turkey-red, alizarine-red, and para-red dyer uses soap after dyeing his cotton goods. The object is to bring about a brightening effect on the color, while there is no doubt the operation tends to fix the color on the cotton better. The soap affects these objects by first removing any excess of dyestuff from the cotton, which has not been united with the mordant that was first fixed on the cotton, and which excess of dyestuff, if left in, would dull the color and might subsequently give rise to stains. Secondly, there is no doubt that the soap has a tendency to enter into combination with the dyestuff on the one hand and the mordant on the other, so that a triple combination of soap, dye, and mordant is fixed on the cotton, which is faster and brighter than a simple combination of dye and mordant.

The soaping is generally effected by working or passing the dyed goods through a soap liquor of a strength of 2lb. per 50 gallons of water at about 150 deg. F. The best soap for this purpose is a green olive-oil soap, made from sulphur olive-oil, and known as Marseilles soap. This is made to contain 62 to 64 per cent of oil, with a corresponding proportion of alkali and water. Olive-oil soaps are fairly soluble, and leave no unpleasant odour behind them. Palm-oil soaps also work well; they are not so

soluble as olive-oil soaps; they have a pleasant characteristic odour, and do not go rancid. Tallow soaps have been and are sometimes used, but they lack solubility, and have some tendency to go rancid, hence their use is not advisable.

CALICO PRINTERS' SOAP.

Calico printers use soap to a considerable extent in the final operations of washing and clearing the printed cloths. The soap is made into a liquor of a strength of approximately 1½ lb. of soap to 50 gallons of water; some printers will use a stronger liquor, others a weaker liquor. Then the dyestuffs with which the cotton cloths have been printed have some influence. Thus alizarine and alizarine colors in general require a stronger soap liquor than do basic dyes, like methyl violet or methylene blue. Mordant dyes, like alizarine yellow, chrome red, etc., take a medium strength of soap liquor.

The function of the soap is not thoroughly understood. No doubt it plays several parts, which will vary according to the dye or dyes that have been printed on the cotton. In all cases it has a clearing action on the gum or starch thickening used in the composition of the printing pastes, facilitating the solution of these, and therefore their removal from the cloth. In the case of alizarine and mordant dyes in general, it has a decidedly brightening and fixing action. Probably this is brought about by a removal of excess of dyestuff that has not entered into combination with the mordant, thus helping to brighten the color, while the fatty matter of the soap may enter into combination with the mordant, and thus tend to fix it on the cloth, at the same time bringing about a more complete combination of mordant and dye, a triple compound of fat, mordant, and dye being formed as a kind of lake pigment, which is fast and bright.

In the case of basic dyes probably the soap may remove traces of dye which has not properly entered into combination with the tannin-antimony mordant used, and so tend to make the finished print faster to washing. Possibly also some of the fatty matter of the soap may enter into combination with the antimony, etc., and help to render it more insoluble, and in that way printed fabrics may be produced which are faster to washing than would otherwise be the case.

Soaps which are best adapted for treating printed calicoes and other fabrics should be easily soluble in water, and therefore oil soaps are best. They should be quite neutral (as any free alkali would be liable to change the tints of some colours and make others run), must contain no rosin, and must be such as do not leave any objectionable odour on the material, hence cotton seed and maize-oil soaps should not be used.

The question of solubility of the soaps used with calico prints is a very important one, for the more soluble the soap the more fluid is the liquor it makes, and the more easily will it penetrate into the fabric as the latter passes through the soap liquor; while, further, the temperature of the soap-bath need not be raised so high. The best and the most easily soluble soaps would be, of course, neutral potash soft soaps, and such are even used by some calico printers for their best and most expensive prints. Calico printers' soaps should be quite free from fillings of any kind. Some of them may contain 1 to 2 per cent of common salt or sodium sulphate, the presence of which is of no practical moment and cannot always be avoided.

While hard soaps may be used for soaping cotton, silk, and half-silk fabrics, for soaping woollen and half-woollen cloths (delaines,) it is preferable to employ soft potash soaps, for these tend to more thoroughly preserve the lustre and pliability of the wool fibre. Such soaps must be quite neutral, and contain no free fat.

CANADIAN CHEMICAL INDUSTRY.

A Correspondent writes to the *Times* (Trade Supplement):—

The achievements of Canada in the development of the chemical industry during the past four or five years have been so remarkable that the question may well be asked whether the country is likely in the future to continue to progress at the same rate.

In a survey of what has been done, Mr. S. J. Cook (Chemist in Charge of the Food and Drugs Laboratory of the Department of Trade and Commerce, Canada) remarks that "the energy and enthusiasm of the chemists of America is notable, and if manufacturers representing the financial and natural resources of the country, and the chemists with their scientific training urging their imagination and initiative, can pool their abilities for the common good, there will be built up in Canada, in the years to come, a chemical industry of which not only the chemists and the manufacturers, but the people will have just reason to be proud."

This survey occurs in a directory of the chemical industries in Canada issued by the Dominion Bureau of Statistics, and shows that at the beginning of the present year there were 634 plants operated by nearly 500 Canadian firms.

TENFOLD EXPANSION IN SEVEN YEARS.

The enormous expansion of the industry in Canada cannot be better illustrated than by quoting the export figures for the fiscal years 1912-19:—

DRUGS, DYES, AND CHEMICALS.

Year ended		Dollars.
March 31.		
1912	...	1,677,216
1913	...	1,800,437
1914	...	1,730,203
1915	...	3,543,701
1916	...	6,449,145
1917	...	9,218,415
1918	...	14,207,609
1919	...	17,053,074

Mr. Cook points out that not a few people still hold the opinion that we must look back to the period before the war as the foundation upon which to base our calculations for the period upon which we are entering, and he agrees that to a certain extent this is true. At the same time, he says that it must be remembered that many other industries have laid aside their peaceful activities, and that the extent to which they will return to their pre-war production is problematical. "The country is filled with new ideas, and cannot ever be just the same again."

The factors that will count in the progress to be made in the Canadian chemical industry are the co-operation of the representatives of capital and the support of popular sentiment. The influence of the latter as a force in the country is, as Mr. Cook observes, often over-looked, and he thinks Canada might with advantage take a page from the German note-book, for "in every land, where an industry of national importance is to be built up, the people must be educated to its importance and value." Supporting this view, he quotes from the report made by the Alien Property Custodian of the United States on the "Chemical Industry," as follows:—

It seems to have been regarded as the duty of a good German chemist in the United States to preach the doctrine of the invincibility of the German chemical industry, the impossible difficulty of the processes of many important dyes, and the hopelessness of procuring the necessary technically trained men and skilled labour outside of Germany. If Canada listened to doctrine of this sort she was not alone in doing so, but her successes in the chemical field during the war have done much to instil ideas which lead a vigorous people to the accomplishment of great deeds.

SHAWINIGAN ACETIC ACID PLANT.

Probably the most conspicuous development in Canada was the erection of the world's largest

glacial acetic acid plant built for war purposes at Shawinigan, Quebec, where an entirely new process beginning with acetylene was carried out. Acetone, paraldehyde, crotonaldehyde, mercuric oxide, and manganese acetate are also produced, while magnesium, of a purity ranging from 99 per cent to 99.9 per cent is made electrolytically from its fused salts. At Niagara Falls there has been an adaption to the manufacture of fixed atmospheric nitrogen as cyanamide, the lime-nitrogen fertilizer, and its conversion into ammonium salts. Among electric-furnace products which are native to Niagara and Shawinigan are aluminous abrasives, ferro-silicon, &c. As Mr. Cook says, it is in connexion with the utilization of Canada's water-power that the most spectacular development has taken place, but progress does not depend upon that factor entirely.

In the manufacture of munitions of war there arose a demand for acetic acid and acetone which stimulated the wood distillation industries of the country, with the result that not only was the output of these products greatly increased, but acetic anhydride, methyl acetate, and special grades of acetone-alcohol and acetone oils were added to the list of products.

COAL-TAR DYE PRODUCTION.

Before the war Germany supplied approximately nine-tenths of the world's needs of coal-tar dyes alone, and while Mr. Cook states that it is not probable that a coal-tar dye industry will be built up in Canada, such as have been started in Great Britain and the United States, some coal-tar medicinals have been made in Canada and he thinks there seems to be a field for this line of work. As he points out, salicylic acid and the well-known acetyl derivative, better known as aspirin, are now made in Canada, while coumarin, benzoic acid, benzoate of soda, and benzaldehyde are further names in the list of new Canadian chemicals. New disinfectants, closely resembling former German products, are appearing from Canadian factories, and the distillation of coal-tar is being more extensively carried on. It is pointed out that "a further use of coal-tar products is in the preservation of wood by creosoting and in the manufacture of tarred felts, as well as the various grades of tar and pitch used in roofing, paving, waterproofing, and road treating. These products will need considerable advertising in order to bring to the attention of the Canadian people the fact that quantities of these supplies are now produced in this country."

War needs led some of the older houses into new lines, such, for instance, as the manufacture of oleum for use in the making of high explosives; new acid plants have sprung up, and there are now

largely increased facilities for the production of sulphuric, nitric, and mixed acids. Soda ash is now made in Canada, and one firm produces hydro-flu-silicic acid, another picric acid, and another plant makes molybdic acid as well as its ammonium salt. Two Canadian houses list chlorates of soda and potash, one of which also makes phosphorus, and the other perchlorates in commercial quantities.

ELECTRO-METALLURGY.

In regard to metallurgy, and particularly in electro-metallurgy, Mr. Cook reports much progress:—

Silico-manganese for use in the manufacture of manganese steel, and high-grade ferro-silicon for the use of the British Admiralty as a source of hydrogen, were new lines developed by one firm as a war effort. Many new electric furnaces have been installed, and the immensity of the output of steel under the direction of the Imperial Munitions Board is so well known as not to need more than passing mention here. The refining of Canadian nickel in Canada is at last being undertaken, and two large plants are under construction for this purpose. The refining of graphite has been the subject of considerable thought and expense, but so far has not been carried on with commensurate success. One firm expects to commence operations shortly, and another is under consideration.

During the war Canada built up large industries employing thousands of workers. Many of the plants operated by the Imperial Munitions Board have, however, already been closed down and in some instances dismantled, and Mr. Cook rightly remarks that "unless many of these factories can find peace-time uses for their war-time products, much of the advantage we have gained in the way of commercial chemical progress will be lost." The Dominion has, however, many plants devoted to the chemical industry which are still operating, and there is room for yet others.

ECONOMIC NOTES. INDUSTRIES AND COMMERCE.

Industries of Western India.

The following extracts from the Annual Report of the Director of Industries of the Bombay Presidency for the year 1917-18, give a "resume" of the work done by the Industries Department in connection with the chief industries examined:—

HANDLOOM WEAVING.

This department was handed over by the Registrar of Co-operative Societies from the 1st of April, 1918, and has continued to be run on the old lines. Certain changes are at present under consideration, but I am not entirely satisfied that the existing organisation, useful as it has undoubtedly been, is the most economic possible. Detailed proposals will be submitted after further discussion, but generally I am inclined to think that schools should be run by local bodies with the assistance possibly of grants-in-aid, as is the case in Madras and elsewhere. The present cost for a school is far higher (Rs. 1,500 per annum) than was originally contemplated by Mr. Pomfret (Rs. 600 per annum with a possibility of being self-supporting in a year). Demonstrations have continued under Mr. Wagh, but here too I consider that a change of method may be beneficial. I found that in the Central Provinces where also the main line of work is the popularisation of a simple form of fly-shuttle loom, they employ demonstrators on Rs. 15 per month only and give them a bonus of 8 as. on every loom which they introduce in any area. The manufacture of these looms has been taken up, I find, in many weaving centres in the Bombay Presidency, and I think, that with the assistance of a weaving carpenter, it should be possible to encourage such manufacture at new centres. The number of demonstrators can thus be largely increased without any extra business and they will become selling agents to the manufacturers. It is mainly a business proposition and should gradually be treated more and more as such. On the other hand, I am of the opinion that more should be done by the Department in introducing new patterns, and above all in creating a local demand before teaching new methods. The schools have suffered like other institutions from the prevailing epidemic of influenza and the weaving industry generally has been hampered by the high price of yarns, the uncertainty of the market, and the difficulty of obtaining dyes. I have noticed in the course of my tour

some interesting small power installations in various weaving centres, and I propose to investigate the limits within which such transition is desirable and should be encouraged for the weaving of coarse cloth.

POTTERY.

Besides the testing of clays, drawings for kilns, factory buildings, and staff quarters for the proposed new Pottery Demonstration Factory were prepared and notes and estimate for the scheme were made and forwarded to the Director of Industries by the Superintendent of Pottery. Practically the whole of the Thana District within one mile on both sides of the country adjoining the road from Thana to Belapur, and from Thana to Uran *via* Panvel, have been minutely examined for clay deposits.

The country within a two miles radius of Thana Road Station in the Lakhtar State of Kathiawar was surveyed by the Superintendent of Pottery, and very valuable clay beds, especially fire clays, were exposed.

The manufacture of bricks, and to a small extent roofing tiles, is carried on in different parts of the Presidency. No other branch of the Pottery Industry has yet been attempted in Bombay, notwithstanding the abundance of raw material, but it is hoped that when the Demonstration Factory, for which proposals are being prepared, is established, the commercial possibilities of various new lines of work will be indicated and a practical training given to pupils who wish to learn the various processes in connection with the manufacture of earthenware.

The brick industry is flourishing but the quality of the article leaves much to be desired, and it has been demonstrated that a far superior brick to the ordinary Kalyan brick can be made from material found in the vicinity of Bombay. The lime and sand brick works at Marwa in Salsette and the Western India Brick Company's Works at Worlee also show that the brick industry is attracting capital and brains at the present juncture.

The roofing tile industry requires encouragement and guiding along right lines of manufacture and management. Some progress has been made in the Belgaum District where capital is being invested and Mangalore workmen employed, but larger commercial ventures are in view in the neighbourhood of Bombay City, and considerable progress may be shortly expected.

OILSEED CRUSHING.

The production of vegetable oils in this Presidency has increased of late years. The difficulty, however would appear to be that the right type of machinery is lacking and that at present installed is not properly worked. Batteries of rotary ghanies are the commonest form of advance on the old bullock press and

the American Anderson's expeller, which, however, is sold at too high a price and is not suitable for all kinds of seeds, also has its devotees. It is understood that the American oilseed industry is in a similar plight, and everyone is looking for the ideal method of oil extraction. The method which has the most universal application in industrialised countries is undoubtedly the hydraulic press, particularly the large and more powerful types. In this way large quantities of seeds can be pressed at one time. This is a matter of commercial importance, since fresh seeds arriving on the market can be dealt with at once. Again better methods than those at present in use for heating the seeds require to be tested, as the use of steam has several drawbacks. The introduction of more efficient methods of decortication, deshelling and washin of seeds would result in the production of purer articles and effect a saving in labour. Practically all the problems connected with the oilseed industry in India are mechanical ones and require the co-operation of expert engineers and oil chemists. With regard to the better utilisation of the oils, methods of purification should be adopted, and such oils would then be of value as edible oils.

The whole question of the use of oilseed cake for human and cattle food depends on the use of proper machinery, and this will effect an improvement on the yield of oil from these oilseeds. The proper decortication, cleansing and pressing of cottonseed is another subject worthy of considerable attention. The oil when purified would be of great value as an edible oil, and the resulting cake should have a prominent place as a highly nutritious food-stuff. Finally, a great future awaits the Indian vegetable oil trade with the introduction of hydrogenation, resulting in the production of solidified oil. The saving in transport alone would be enormous, apart from the production of a wholesome and efficient substitute for 'ghee.'

DAIRYING.

This question is largely one of an agricultural nature, but there is a distinct chemical side which awaits development. Buffalo milk yields a large quantity of fat, and after this has been removed, the separated milk can be used for the preparation of casein, and also milk sugar. Casein is an article of considerable commercial importance, and the Casein Company of New York, alone would monopolise all the casein produced in India. The technical applications of casein are almost unlimited, and hence the demand for casein in America and England. Milk sugar (Lactose) is also a valuable product, and it would appear from observations made that buffalo milk is particularly well adapted for yielding a good quantity of this sugar. It enters very largely into all

forms of infant's food, and commands a high price, especially when pure.

For these two products alone, apart from the question of butter and cheese-making, the dairying industry merits encouragement and development.

BITTERNS.

The proper utilisation of bitterns has stood apart as the prime subject of investigation by this Department. The reason for this is that Kharaghoda offers such a promising field for future industrial development. There are of course considerable obstacles in the way of commercial developments, chief amongst them being fuel, water supply, labour and transport.

To overcome the first we attempt to utilise the natural heat of the sun as far as possible, and to this end special pans are being constructed. This will, we hope, reduce the consumption of both fuel and water. The transport difficulty is to be averted to a certain extent by the introduction of a pipeline to convey the bitterns by mechanical means to the factory. There will thus be a saving of labour, which is also a problem of no small magnitude in an isolated place like Kharaghoda. To show the possibilities of the bittern industry, I append the following figures showing the quantity of salts at present wasted in India:

Magnesium Chloride, 193,000 tons.

Magnesium Sulphate, 127,000 tons.

Potassium Chloride, 20,000 tons.

Bromine, 1,800 tons.

FISHERIES.

A general survey of the conditions obtaining along our coasts was made in the hot weather. There is obvious scope for improvement in the present methods of curing fish, and the possibilities of canning on the lines adopted in the Madras Presidency must be tried and demonstrated. As compared with Madras, the supply of sardines except in the very south of the Presidency is too uncertain for any extensive operations. But the catches of mackerel (*scomber microlepidotus*) are considerable and this fish has been successfully canned in Madras. A large trade is done particularly from Karachi in the sounds of the gol fish (*Sciæna sina*). We still export these for the manufacture of isinglass, and any visitor to the Crawford Market can see these sounds being collected in the fish market, while next door the manufactured isinglass is offered for sale. The possibility of the manufacture of the commercial article should be examined. A very large revenue is also derived from the traffic in sharks' fins which are exported to China as an article of food. So little is known at present about the possibilities of our fisheries that it is useless to say more for it in advance. Mr. Walke

has been devoting part of his time to examining local conditions, chiefly along the Kanara and Ratnagiri coasts and will shortly, it is hoped, be appointed as a wholtime officer under the Department. The necessity for scientific investigation as well as organisation has not been overlooked, and proposals will be submitted shortly.

GLASS

War conditions while generally hampering industries, have temporarily assisted others through restrictions on freights, and glass is one of these. Five glass-making concerns have started in Bombay City during the war, and in spite of difficulties in connection with coal supplies, have met to some extent the local demand for cheap lampware in particular. The factory at Sunth Road closed during the year under Report; and its position at a distance, both from markets and fuel supplies, was obviously not in its favour. The glass works at Talegaon continue to work on altruistic lines and supply blowers to many of the new works. Some progress was also made by the Ogale Brothers at Karad. Nearly all the glass works in this Presidency obtain their supplies of sand from Naini near Allahabad. The sand is suitable, but it is quite possible that nearer supplies of equal value will be discovered. Two of the glass works of Bombay are under Japanese managers, and two are attached to established trading concerns in glassware. All use direct-fired Japanese pot furnaces, and their consumption of coal, even allowing for the bad quality of some of the coal supply, is uneconomical in many cases. It is possible that in the future oil may be employed with success, but the supplies at present are too limited and freights too high to bring oil within the limits of practical politics. Probably one of the greatest needs of the glass industry at present is the provision of an expert who can construct furnaces on the regenerative or recuperative principle for the economic melting of glass.

OTHER INDUSTRIES.

The possibilities of sugar manufacture are shortly to be tested by a local syndicate in the Ahmednagar District, where a suitable block of land on one of the new canals has been acquired with a view to its lease to the syndicate. The high price of Deccan gul makes the price of cane far higher than it is in Behar, and one essential for success is the growth for the factory of its own cane by improved methods. The syndicate's operations are watched with considerable interest and must prove of the greatest value as a lesson in the economical utilisation of water and manure, if for no other reason.

The Department is mainly interested of course in nascent industries. Occasionally a moribund industry must be examined if only to discover whether it

should be regarded as a shocking example or can in any way be revitalised. The Match industry in this Presidency is a case in point. Leaving aside derelict machinery, I have inspected one running concern and also made enquiries about their past experiences in pre-war conditions. Wood of course is the main difficulty, and it is exceedingly doubtful whether a really satisfactory wood for splints can be found in sufficiently large quantities and concentrated within a reasonable area to make the manufacture of splints a possible commercial undertaking. The common silk cotton tree (*Bombax Melbaricum*) provided a good enough timber for the boxes. But even if obtainable in specially large quantities for commercial purposes, the wood is useless for splints. The greatest success in the past seems to have been obtained with imported splints from Sweden, which is not encouraging. As a shocking example to point the moral of necessary preliminary enquiries and proper consideration of all the factors underlying commercial production, the Match industry on this side of India has its uses.

To turn to brighter subjects, Brush making has made some progress. Many of the materials such as bristles and fibres have to be imported at present, but it is possible the substitutes may be found for some of these. The class of articles produced has undoubtedly improved.

Button-making has attracted attention in the past and may command more notice in the future. The raw materials are available in the shape of bone and horn, to say nothing of the 'hoka' nut found in the south coast of Kathiawar, and the tali palm seeds available in Kanara which are already used for making coat-buttons, studs, etc., Mother-of-pearl from the Persian Gulf comes into Bombay normally, and could be made up easier here than at Dacca where the industry at present flourishes. The only buttons being made at present on this side are stamped out of aluminium sheets. The Department has taken over temporarily certain buttonmaking machinery and proposes to experiment and examine the possibilities.

In the absence of any available expert, no experiments have been made with tanning on this side of India. The experience gained in the Dharavi Tanneries working under the Munitions Board, seems to show that under suitable direction considerable progress might be made. Experiments on a large scale have been carried out at Maihar in Central India under the Munitions Board and their results are certain to be interesting and helpful.

Leather belting is made in Bombay, and its suitability to compete with the imported article is under investigation.

Roller skins, picker-bands, and pickers, have also been manufactured, but are not yet up to the required standard. It has been argued that English pickers are superior, because they have been seasoned for six months or more in sperm oil, but I find on enquiry that the mills in Bombay do not consider the seasoning sufficient and adopt their own measures even with the English article. It is always an attractive proposition to try and encourage the manufacture of some article in common industrial use, but unless large stocks of a thoroughly adequate article are carried, industrialists naturally decline to run any risks and prefer to import something on which experience teaches them that they can rely.

In connection with the forests, a few small matters engaged the attention of this Department. The undoubted possibilities of the salai trees in Khandesh to which Mr. Pearson called our attention sometime back, are to be further investigated. As pointed out in the Industrial Commission's Report, these Indian turpentine differ from the ordinary commercial variety, and it is possible that by special treatment still more valuable products will be obtainable. There is still, I believe, a little more laboratory work to be done before establishing a small plant on a commercial scale for demonstration purposes, and this is being undertaken. Experiments are being made under the Conservator of Forests, Southern Circle, to test various kinds of woods for the suitability for cask-making, and an ingenious device has been designed in Bombay for cutting cask staves. The distillation of rosha oil by steam should by now have been a *fait accompli*, but there have been serious delays in getting the plant made.

Lastly, various small enquiries and indents from the Munitions Board have been attended to so far as possible with the inadequate staff at my command. For this, as already noted, special war conditions have been entirely responsible, and little more has been done than to survey the general field and give assistance wherever possible and endeavour to ascertain where help and advice can be most profitably employed for the future.

SILK IN SWITZERLAND.

There is no improvement in the situation of the silk industry. This industry is at the moment completely isolated in the international market. All exportation, even to the neutrals of Northern Europe is completely suspended, and the manufacturers have been obliged to limit their production. Many factories are threatened with a complete stoppage.

The difficulty arises chiefly through the impossibility of obtaining raw material from foreign countries.

At the end of the War the general opinion was that the prices of raw materials would automatically decrease. This led to the failure to buy sufficient material through the fear of serious loss. In this way the silk manufacturers ceased entirely to import raw material.

Italy is the chief furnisher of raw silk to Switzerland, and during the War the obstacles in the way of obtaining supplies from that country have been almost insurmountable. The telegraphic service was suspended, the frontier closed for weeks together, a period of 15 days was necessary before a letter reached its destination, and transport was defective. In the first few months of 1918 a legal action was started against the "Societa per la Filatura dei Cascami di Seta," as a consequence of which several people connected with the silk industry in Italy were arrested. This was the opening of a virtual war against the silk industry in that country. Black lists were established, on which figured Italian firms dealing in raw silk with Swiss houses in Italy and in Swiss manufactures. The supply from France was more satisfactory, although the French black list system operated with some amount of hardship in the case of several Swiss silk firms.

After the Armistice the Italian Government instituted a monopoly of Italian raw silk, which was vested in the State administrative "Ufficio d'Acquisto delle Sete Italiane." The object of this policy is to maintain the prices at a figure eminently favourable to the Italian industrial interests. Swiss manufacturers are disposed to regard this measure favourably at present, as a possible means of maintaining prices at the present level in the Swiss as well as the Italian market.

Large stocks of silk are at present lying in Italy waiting for export to Switzerland, but business is hindered by the regulation that foreign buyers must pay in advance.

QUALITY OF AMERICAN DYES.

In a report issued to the stockholders of the American Chemical Foundation a claim is made in favour of the superior quality of American dyes. The total American output of dyes in 1917 is valued in the report at 57,796,228 dols., and that of 1918 at 83,095,404 dols. During 1918 the export trade grew rapidly, the total exports of dyes for the fiscal year amounting to 16,921,388 dols. In June, 1919, aniline dyes valued at 743,476 dols., were cleared for export from the port of New York.

The present strong American demand for Swiss dyes is accounted for in the report by the fact that most of the vat dyes are not manufactured in America in any quantity, but it is stated that the six months' supply of German dyes, permitted by the Government to come forward under the supervision of the War Trade Board, is expected to remedy some of the defects in the vat dye situation. Meanwhile, three different plants are manufacturing indigo in quantities, and are promising other vat dyes in the near future.

In regard to the control of dye factories in the occupied areas in Germany, a resolution was adopted by the dye section of the American Chemical Society that an urgent request should be made to the President that America should have her share in the operating control of these factories, and that qualified representatives should be stationed there, the information gained to be used for the benefit of the American industry.

It was also resolved that as the manufacture of dye from coal tar distillates involves the same process and material as that used in the manufacture of explosives and poison gas for military purposes, the question of the importation of dyes and bases of intermediates be made a military question, on the ground that importation is a menace to the possible future defence of the country, as it fosters foreign industries which would furnish an enemy with munitions of war, and discourages the development of home industry essential to defence.

Among other resolutions passed was one endorsing pending legislation to establish an independent Patent and Trade-mark Office, and a United States Court of Patent Appeals at Washington, and one protesting against the printing on hotel laundry bills of announcements to the effect that no responsibility would be assumed in caring for guests' laundry, owing to dyes.

A prominent American manufacturer of cloaks and dyes, writing recently to the "Daily News Record," does not agree with some of the claims advanced in the above report. He asserts that the public demands fast dyes, and manufacturers will soon be tired of employing dyes which will not give satisfaction.

INDIAN CURRENCY.

Stabilizing the Rupee.

Mr. Gilbert Slater, Professor of Indian Economics in the University of Madras, writes to the "London Times":—

May I beg for careful consideration of the proposal which I have been urging in India, that the rupee be stabilized at its present value of 2s. by making £1 currency notes legal tender in India at Rs. 10 and 10s. currency notes at Rs. 5? The bearing of this proposal on the American exchange makes it necessary that it should be discussed from the British as well as from the Indian point of view.

India is this year blessed with a very good monsoon, and will have in all probability a great exportable surplus of her chief products—wheat, rice, tea, vegetable oils and oil seeds, raw cotton, coffee rubber, &c. It is most improbable that imports will be sufficient to balance exports. Either, therefore, export must be restricted, or the exports must be financed *i.e.*, they must be paid for in money. The ordinary way of doing this is by sale of Council bills in London for British money, these bills being cashable in India in rupees. When Council bills are issued in excess of the amount raised by taxation in India to meet home charges, additional rupees have to be paid out of the Treasury, and this involves,

sooner or later, more coining of rupees. Since January 1, 1916, India has coined 1,300,000,000 silver rupees, besides greatly inflating the paper currency, and has absorbed much more silver than all the mines of the world have produced in the same period. This process is still going on, and is forcing up the price of silver, which already is so high that it costs 2s. to coin a rupee. A free flow of exports of the Indian produce which is becoming available, and which is so badly wanted in England and elsewhere, therefore under present arrangements inevitably forces up the exchange value of the rupee—*i.e.*, forces down the exchange value of British currency.

If my proposal be adopted this further rise in the rupee will be prevented, and the superfluous financial strength of India, created by its almost complete abstinence (not the fault of Indians) from the efforts and sacrifices of the war, will come to the aid of the present financial weakness of the United Kingdom. The absorption of only a moderate number of currency notes in India will put up their value and speedily bring the American exchange to par, and also prepare the way to convertibility of currency notes into gold. I must however emphasize the point that there must not be any expansion of the currency note issue is consequence of the adoption of my proposal. If there were, the disease would only be spread instead of being cured.

It may be asked whether if the Indian exchange can thus be stabilized, why not stabilize it at the pre-war rate of 1s. 4d. (£1—15 rupees) instead of at the present, and also the old and long standing rate of 2s. (£1—10 rupees), by making the £1 currency note legal tender in India at Rs. 15. The answer is that to do so would involve a great rise in prices in India, prices already being so high as to cause acute distress among vast numbers of people, and a collapse of the present financial basis of Indian government. India is far less fitted to cope with violent fluctuations in the average price level than Western nations, and the attempt to stabilize the rupee by means which would greatly enhance prices would be disastrous.

From the Indian point of view the chief considerations are that with a fluctuating rupee international trade is a gamble, and the acceptance of appointments by Civil servants and others in India is also a gamble. India profited enormously by the stable rupee of the pre-war period, and badly needs a restabilization. This can only be obtained in one of the following ways:—

- (1) By my method of making British currency notes legal tender in India at the present rate of exchange.
- (2) By making Indian paper money inconvertible and issuing it freely.
- (3) By lowering the silver contents of the rupee.
- (4) By prohibiting or heavily taxing Indian exports.
- (5) By freely importing gold into India.

Of these alternatives (2) and (3) would be disastrous to India; (4) an injury to India and a disaster to Great Britain; (5) would drain away a practically unlimited quantity of gold into India and depreciate paper money in all the rest of the world. But (1) pools the financial strength of the Empire, and benefits all portions. It means cheaper food and more employment.

BOOKS IN BRIEF.

The Great Problems of British Statesmanship—By J. Ellis Barker—Second Edition John Murray, London, 12sh. net.

This is a reprint of articles which originally appeared in the *Nineteenth Century and After*. The articles attracted very wide attention at the time of their publication and the fact that a first edition of the book was exhausted within two months of its publication shows that it has been rightly appreciated all over the world. The book is not however made up merely of the original articles published in the *Nineteenth Century and After*; these have been revised, brought up-to-date, and organically connected. In the opening chapter of the book, the reader who is anxious to have a conveniently good summary of Mr. Barker's views will find a general outline of its contents. Mr. Barker's qualifications for issuing a book of this kind are set out by him in the preface to this book, but it is hardly necessary to those who are at all acquainted with his writings in the British press to quote them here. But one fact may be noted as showing how correct he was, in the pre-war days, of his estimate of German designs and aims. "Ever since 1900 when I began my career as a publicist" he says, "I have warned this country of the danger of a war with Germany. In all my books and in innumerable articles printed in the leading reviews and elsewhere I have urged unceasingly the necessity of diplomatic, military, and economic preparation, the necessity of abandoning the policy of 'splendid isolation' for one of alliances with France, Russia, Japan and the United States, the necessity of creating a national army the necessity of strengthening the British industries, and especially the iron and steel industry, by a policy of deliberate development, by a protective tariff, the necessity of vastly increasing agricultural production, by peasant proprietorship and various other means, the necessity of developing the neglected railway and canal systems of Great Britain, the desirability of an Anglo-American reunion etc.....It is a certain satisfaction that all the reforms which so many have urged in vain before the War seem likely to be carried out in consequence of it. The ways of Providence are wonderful. Iron is tried by fire and nations by war. A new and greater Britain is arising. The War may not only make the British Empire a reality, but bring about an Anglo-American reunion. The War, far from being an unmitigated evil, may prove a blessing to the British race." Mr. Barker's views and suggestions on foreign policy, on economic problems and on internal organization are worth careful study by all those in this country who desire to take an intelligent interest in the coming development of the British Empire. His chapter on the problem of Constantinople shews how closely India was and is connected with the problem of Eastern Europe. It throws much fresh light on Napoleonic designs on India and Tipu's foolish dreams of driving the English out of India towards the close of the 18th century. Very suggestive, again, are the views of Mr. Barker in regard to the problems of Constantinople, Asiatic Turkey, Austria-Hungary, and Poland. In regard to Asiatic Turkey, he wants it to be neutralized, the Turks being under the political tutelage of Britain until they are fit to govern themselves. Many of

Mr. Barker's suggestions in regard to British finance have been already adopted by the Government which speaks for itself. There are also chapters on "Anglo-American Reunion," "The German Emperor's position" etc. all of which show what careful thought Mr. Barker has brought to bear on his work. We would commend the book to all interested in current European problems as a safe guide.

Instincts in Industry—By Ordway Tead, Published by Messrs. Constable & Co., London 6sh.

So far as we are aware, this is the first book of its kind. Mr. Tead strikes virgin soil in it. His aim "throughout is to establish an understanding point of view towards familiar activities in the industrial world—a point of view which construes human behaviour as having an organic relation to the human nervous system and its environment, past and present." As Mr. Tead puts it "the book is an effort toward a better understanding of people in their capacity as manual workers" Mr. Tead cannot have put his aim in writing the book better. Since the time of Karl Marx the protest has gone forth that the working man is not merely an element in production but a *human being*. In no book that we have read in recent times has the protest been analysed better—for it is done scientifically—than in Mr. Tead's book. It ought to form a distinct addition to the few really standard works we have on the subject, on which Mr. Tead has written with so much knowledge and precision.

Karl Marx—The Man and His Work. By Karl Dannerberg, Published by the "Radical Review" Publishing Association, New York, Thirty-Cents.

This is a reprint of three lectures and two essays which originally appeared in the *Radical Review*. The lectures and the essays together give a complete picture of Karl Marx and his work. Their chief merit is that they give in very brief compass what can only be gathered after a laborious study of Marx. The intellectual sympathy which Karl Dannerberg bears to Karl Marx is so great that the picture he draws is one that does not lack reality. The study of Marxism which the author gives in the first of the two essays deserves special commendation.

In-come Tax.—How to avoid over charges and obtain repayments. By A. D. Macmillan, formerly Surveyor of Taxes. Published by Eppingham Wilson, 54 Threadneedle Street, London E C 2.

Mr. Macmillan deserves thanks for the practical shape he has given his little book. It is not so much a book on Income-tax as one which will serve the needs of every man and woman who has to pay Income-tax, but has not the services of expert accountants and law-yers at their command.

ACKNOWLEDGMENTS.

The Agricultural Development of Baluchistan. By Albert Howard, C. I. E., M. A., Imperial Economic Botanist, and Gabrielle L. C. Howard, M. A., Second Imperial Economic Botanist Calcutta, 1919.

Report on the Operations of the Department of Agriculture, Bengal, for the year 1918-19. Calcutta, 1919. Price-Indian, Rs.2; English, 3s.

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MEMORANDUM ON EDUCATION IN MYSORE.

[In this issue we publish some of the opinions we have received on the Memorandum on Education in Mysore. Ed. M. E. J.]

I.

RAO BAHADUR M. C. RANGAIENGAR B. A.

Member, Mysore University Council.

I trust that it will not be considered presumptuous of me, if I venture to congratulate the Government upon the beneficent proposal contained in their admirable memorandum on Education in Mysore.

I am in general agreement with the Government in many of the proposals formulated in that important document. In a few respects I happen to differ from the proposals of the Government as may be gathered from the subjoined views expressed with due respect and diffidence.

THE PRIMARY SCHOOL COURSE.

(a) This course should be one of 4 years. Anything short of it will not secure permanent literacy and will fail to create the requisite taste for reading and desire for self-improvement.

(b) The instruction should be entirely in the vernacular.

(c) The curriculum should include Nature Study and Elementary Hygiene.

(d) The control and management of primary schools should continue for some years to come, in the hands of the Government, at all events until all the schools are well organized and placed on an efficient basis. The present condition of the generality of the local bodies in Mysore is such as to improbabilize efficient management.

(e) As regards finance, I favour the 3rd alternative, *viz.* the Village fund, Local funds general and Educational cess on Land Revenue and Excise as being sufficiently adequate and elastic.

THE MIDDLE SCHOOL COURSE.

(a) I am of opinion that the course may be restricted to one of 3 years' duration. I do not oppose the period of 4 years at present obtaining. But since the Primary Course is lengthened by one year, I would shorten the Middle School Course by one year so as to enable a pupil of ordinary intelligence and diligence to complete the primary and middle school courses in 7 years. That is, a pupil commencing his or her Alphabet in the 6th year of age will ordinarily have passed the middle

School Examination in the 13th year.

- (b) English as a Language should be made a Second Language of study. It may be made compulsory, exceptions however being provided to be granted in the case of pupils desiring to study for Higher Examinations only in the Vernacular. In other words, I would make English a compulsory 2nd Language in the sense that the Government should provide for teaching English in every Middle School whether or not there is a sufficiently large demand.
- (c) Elementary Science, Advanced Hygiene and Vocational Training should be included in the curriculum.
- (d) All the subjects prescribed excepting English as a Language should be taught in the Vernacular.
- (e) At the end of the course there should be a Public Examination.

THE HIGH SCHOOL COURSE.

- (a) In view of the present unsatisfactory progress made by pupils during their High School Course, I would strongly recommend that the high school course should be one of 4 years, instead of 3 years' duration as at present. Real and substantial progress can thereby be secured and the pupils who leave off further general study and take to professional courses of study or to professional callings, will be sufficiently well-equipped without being handicapped by inadequate preparation. To obviate any possible hardship in the case of individual students of exceptional abilities, the Head Masters may

be given discretion to grant double promotion.

- (b) English should be not only an optional second Language but should also be provided as an *optional subject* of study to ensure the acquisition of proficiency in that language enabling the student to proceed to the University.
- (c) All the subjects prescribed excepting Mathematics and English as a second Language and as an optional subject should be taught in the Vernacular.
- (d) More Advanced Science and Hygiene and Vocational Training should be included in the curriculum.

EDUCATION OF GIRLS ETC.

The curriculum and the courses of study should be the same as for the boys until the completion of the Middle School Course. In the High School Course differentiation may be made by providing a large number of optionals to suit the particular requirements of girls and women.

Mahomedans may be given special schools if so desired and if the demand is sufficiently large.

Backward persons of all communities should receive special encouragement to study in schools. I am opposed to the classification of the subjects of the State into backward and forward communities, for the reasons which I have set out elsewhere. Large numbers of backward persons are unfortunately to be found in every community even in the so-called "forward" communities who stand in urgent need of help and encouragement. They ought not to be ignored and left to shift for themselves merely because they happen to be born in certain communities, a few members of which have been so fortunate as to receive higher

education and to occupy prominent positions in the Public Service.

DEPRESSED CLASSES.

I would respectfully urge with all the vehemence at my command that the country is not yet ripe for the co-instruction of these classes along with the other classes of people in the State, more especially in the primary and middle school stages of instruction. The depressed classes should certainly be enabled by all reasonable and prudent means to rise socially and intellectually. For this purpose at the present time and for some years to come it is advisable to give them special schools and special and generous encouragement. Special Hostels should be provided for them in which they will be taught and habituated to lead a pure and cleanly life in matters relating to food, clothing, bathing etc. so as to become less objectionable, if not altogether unobjectionable, to pupils belonging to other communities.

TRAINING OF TEACHERS.

One Training College for the whole state with a sufficient number of suitably located Training Schools affiliated to the training college is a prime necessity.

RELIGIOUS INSTRUCTION.

I am in full agreement with the proposal of the Government that earnest and continuous effort should be made to impart direct non-sectarian religious and moral instruction to the pupils in all stages of education.

PUBLIC EXAMINATIONS.

One examination at the end of the Primary School Course, one at the end of the Middle school Course and one at the end of the High School Course are necessary.

AIDED SCHOOLS.

In my humble opinion, efforts should be made to encourage the starting and maintenance on an efficient basis of denominational schools to meet the requirements of the people in their present state of social and

intellectual development. Grants on a reasonably liberal scale should be granted to such institutions. I deprecate compulsion in regard to the admission into such schools of pupils belonging to communities considered objectionable by the managers of such schools.

FREE EDUCATION.

I am entirely in favour of making education free in all grades. The question of expense disappears if the money spent on public education is considered (as it ought to be) as an Investment. The case for free education in Mysore is all the stronger for the admitted reason that the return to the Government in the shape of school fees is quite negligible.

AGE OF COMPULSORY EDUCATION.

It will soon become advisable, if it is not already so, to fix the compulsory period of education from 7 to 14 years of age. The present limit of 7 to 11 will not secure any permanent literacy to children and will not prevent relapse into illiteracy.

II.

REV. W. PERSTON,

W. M. High School, Mysore.

Every public spirited person will congratulate Government on the issue of this Memorandum. It represents a courageous attempt not only to envisage the educational needs of the state, as a whole, but also to devise a policy to meet those needs worthily and that soon. Informed educational opinion and experience alike give their sanction to the principles which guide the proposals of the Memorandum. These I conceive to be two:—

- (1) Schools ought to be of one type and this ought to be such as provides parallel instruction in Vernacular and English.

- (2) Such schools ought to be established in such numbers as to bring the educational ladder to the feet of the village boy.

The latter principle needs no commendation.

Nor does the former need any commendation which it cannot obtain. If a chance of higher education is to be presented to every child, since acquaintance with the English Language is the *sine quanon* of advanced education in present circumstances, facilities for making such acquaintance early ought to be at hand for every child. This is the educational justification of parallel education Vernacular and English. As to the one type of school; democratic opinion in England, Germany and other western countries after experience of schools differentiated as Scondary and Elementary emphatically declares for one type of school and that made accessible to all.

Recognising and altogether approving the principles of the memorandum I should like to make two remarks on the procedure it suggests.

Directly, then, with respect to the abolition of the Kanarese Lower Secondary certificate, a negative effect of the new proposals. This it seems to me, might be reconsidered, not in a way which would reinstate a purely vernacular educational arrangement but to provide a certificate of a certain standard of vernacular education for pupils who are not successful in mastering English. In this connection I suggest this following considerations:—

- (a) As the memorandum itself suggests by on the one hand, excepting English in the case of students who are proceeding to Higher Oriental Studies and those not proceeding to High Schools, and on the other, by approving Kanarese as a general medium of instruction, an education of some

value is possible in Kanarese. This ought to be true of the new type of school to an extent in which it has never been true in many purely vernacular schools.

- (b) Experience suggests that a considerable proportion of vernacular school pupils have little language faculty and that all the faculties of some others develop late. Both sorts may reach a respectable standard of vernacular education.
- (c) The Elementary teaching profession has been largely recruited from men of the standard of education represented by the Kanarese Lower Secondary. Taught in better equipped schools and more adequately trained, such men ought to continue to make respectable teachers.
- (d) A certificate of educational status has a market value in India and this value ought not to be destroyed unless a greater compensating gain for the same class of people or for the community as a whole, is in view with respect to the large question of the almost immediate provision of a large number of new schools and the consequent emergency training of a large number of new teachers. It seems to me that in face of the recent failure of a scheme to increase the gross number of schools in the State quickly and in view of the fact that the adequate preparation of the teacher is the only sure guarantee of permanence and effectiveness in the new educational work now to be attempted, an endeavour to combine with pace in the provision of new schools adequate training of teachers would ensure the best result.

III.

K. RANGA IYENGAR B.A., LL.B.,

Advocate, Tumkur.

THE GRANT-IN-AID SYSTEM.

The grant-in-aid system which was inaugurated in the year 1914 has no doubt ended in a failure and a wasteful expenditure of public funds. It is also true that this scheme has stimulated a demand for schools in rural areas, the direct consequence of which is that a number of ill-managed schools have sprung up which now require consolidation. All rural schools must be schools over which the Government will have full control. At present the schools under the grant-in-aid system are left without any inspection. In many of the schools the teachers are only getting the Government grant although their schools contain not a single boy.

These schools have suffered greatly because proper teachers are not available to do the work under doubtful conditions. The villagers who, in their enthusiasm to have a school in their village, promise and pay their contribution for the first year, slowly slip back and not only fail to pay but sometimes refuse to pay. It would be harsh if the villagers are compelled to pay. Thus it is necessary that all rural schools will hereafter be Government schools managed mainly by Government agency, in which case efficiency and permanency will have been guaranteed. The voluntary help rendered by the villagers must be kept in reserve for giving prizes to the intelligent boys.

Side by side with the increase of these rural schools, the inspectorate must be increased also. About 30 schools should be placed in charge of an Inspector who must be visiting a school once in a month. He must not only visit the school but also take part in teaching work so that the teachers may learn the art of teaching.

The proposal of the Government to provide for 10,000 primary schools is no doubt

not a very ambitious scheme, considering the importance of educating the masses.

The question of affording trained teachers is no doubt a grave problem, but this problem can easily be solved by trying to find out the natives of the villages where the schools are situated, to do the teaching work. It is impossible to begin with, to ensure ideal conditions. As far as possible the intelligentsia of the village should be trained and utilised. With the adoption of this principle in selecting teachers, the problem of supplying teachers to these primary schools must be an easy task.

It must be the solemn duty of the Government that no school shall be started until the full equipment is guaranteed. Just now the condition of 75 per cent of the present number of school is very miserable in this matter.

Again all these schools should be made to admit girls also, as in villages girls' education is more necessary than that of boys. Hence education for both girls and boys must be made compulsory. This becomes easy if the boys' schools are opened out for girls also.

The hours during which the classes are to be held in villages, must be slightly altered in the Malnad and Maidan parts so as to suit the agricultural conditions. It must never be the object of education to divert a man from one occupation to another. The fate of many industrial countries has been that they have to depend for their food-stuffs upon foreign countries. This mistake of converting an agricultural population into a quill driving population must be avoided, by affording facilities to those who study in these schools to join their parents in doing agricultural work. Education should strengthen the back bone of the country rather than break it. It is not only the class hours that should be so adjusted but also the vacations and other holidays. This would secure better attendance of boys to schools during a portion of the year, when the people are not busy with agricultural work.

IV.

C. NARASIMHAIYA, B.A., B.L.

Member, Mysore Legislative Council.

SPECIAL FEATURES.

- i. A truly democratic programme.
- ii. Evinces that the Government is really and keenly alive to the needs and wants of the people as a whole—at least a desire to be so alive.
- iii. Shows the true spirit of a statesman in as much as it calls for public opinion on the views thereon which purport to effect an overhauling of the present system.

A SPECIAL REQUEST.

- i. It is earnestly hoped that the Government will seriously take into consideration public opinion and modify their proposals accordingly.
- ii. This so-called democratic programme is also radical in its nature. Much of it seems to be based upon the note of the I. G. of Education. Our present I. G. has made a special study of the University Education, at least his deputation was meant for that purpose. Would it not be more reasonable and more fruitful, to take the opinion of a committee of expert Educationists—official and non-official and surely there are other Educationists in the State, though they have not been to foreign countries—instead of calling for public opinion in this hap-hazard way which rarely expresses itself? We have eminent Educationists in the professorial staff; and being in Government service, they may not express their opinions and

views on this all-important subject unless they are asked to do so. A special committee of Educationists, Retired I. G.'s some Professors and some non-Officials who are taking interest in Educational matters—might be appointed to consider this Memorandum and express their opinion on the changes mentioned therein.

Coming to Primary Education.—Compulsory Education and system have been much criticised and ingenious and of course forcible arguments are brought in to show that compulsion works hardship, is an anomaly, is inequitable and grossly unfair to the villages. These forcible and eloquent arguments would lose much of their value, and objections against the compulsory system would be considerably reduced if the question is considered from the proper point of view. The vehemence and eloquence with which compulsory education is denounced as being impracticable and unjust to the villagers, the idea of ideal equality and proportional burden and benefits seem to come from one who is either a rank socialist or a keen worshipper of party faction and communal feelings, or a Utopian philosopher ignorant of the actual world and administration.

The financial objection that the villagers are made to pay for compulsory education, whereas the townspeople are enjoying the benefits gratis and unasked for, seems to be more imaginary than real. If the villagers pay directly for raising a school building under the compulsory scheme the towns people pay indirectly a more than proportionate amount for primary education in the form of Municipal taxes in the cities; and the Municipalities meet a major portion of the expenses of Primary Education in the cities compared to departmental contributions. The financial objection being thus answered, it remains to see whether other objections are

imaginary ones or not and whether they are really insuperable. The compulsory system as introduced in particular areas is charged with unequal and invidious treatment of cities, by establishing schools where there already exist some, and not establishing them where there is real need. This objection too is only superficial in as much as it overlooks the real significance of need. We do not doubt that there is need or that there ought to be need for Primary Schools in villages from the point of view of progress. We all know and the Department ought to know how eager or otherwise the rural population is towards compulsion. It would be unmeaning to say that they clamour for new schools, when most of them have to be compelled against their will to send their boys and girls to schools. The fact is, not that there are no schools in village parts where people really clamour for it, but that there are not enough schools from the compulsory system point of view and in those rural areas which are brought under compulsion scheme, difficulty is experienced of non-attendance and irregular attendance with the unpleasant consequence of imposing penalties on parent defaulters.

The principle of compulsion is obvious enough. Compulsion must be introduced slowly, gradually and by choosing the line of least resistance. Experience has shown that rural parts are not only reluctant but even opposed to sending their boys to school. And urban parts are only too glad to have an opportunity to educate their boys. Hence compulsion is first introduced in the urban parts and is introduced in the village parts on conditions that would secure its continuancy. It is only sensible and reasonable to introduce the scheme in those parts which can really appreciate and respond. But it would be mere child's play to introduce the scheme where there is no heart's response.

The urban population on the average is

poor, relatively poor, and with all the temptations and difficulties of city life, if the people of the urban parts are not given every facility to learn at least the three R's. These uneducated people in the towns, having nothing to do, not even the agricultural occupations, would turn out to be a serious menace and danger to society. Hence it is not merely fruitful, but even expedient and necessary to introduce compulsion in the urban parts first, and then gradually in the rural parts. To regard this a great social injustice, is to lose sight of the very fundamental principles of the compulsory scheme, and perhaps to delight in Rousseau's quibbles of natural justice and perfect equality. A town is a *town*, a village is a *village*. It would be neither desirable nor possible to have all towns and no villages. Hence to denounce the compulsory scheme on the ground of imaginary injustice and in equality it works, does not stand very much to reason and common-sense. We all aim at progress and by no means do we advocate a retrograde step. If compulsion is not quite possible at present in all the villages, that is no reason why it should not be introduced wherever possible and feasible. In the name of progress and civilisation, let us try our best to encourage and spread compulsory education in as many parts as possible and in all parts in the near future.

One other objection against the compulsory scheme needs some answer and that is, that in those parts where it is introduced it is not working properly. This seems to be, not a defect in the system, but a glaring admission of departmental incapacity to successfully cope with the situation and apply the scheme rigorously and tactfully. If earnest and enthusiastic men that can command respect and inspire confidence and can evince tact are chosen for the arduous task of introducing and superintending the scheme, such a difficulty need not arise at all.

Even primary schools must impart free education. The anomaly pointed out by the

I. G. of some of the Primary schools levying fees for teaching English in the II standard must be removed by making the primary course a purely vernacular one, and not teaching English in that standard.

It is very essential both on principle and practice that all primary schools must be managed by the Local bodies, assisted by the department in the matter of Inspection, Curricula and the prescribing of Text-Books.

The curriculum must undergo thorough change. Arithmetic—the first four rules, and calculations based on Rs. A. P. must be taught by the end of the Primary course. History of Mysore and Geography of the same in Kannada must be mastered.

A student by the time he finishes the Primary course, must be enable to read and write fairly Kannada printed books. *Padya-sangraha* and *Neethisangraha* and popular simple poems must be taught. It is most deplorable that boys of this standard seem to betray an awful ignorance of Indian legend and folklore, which ought to find a place in any national system of Education. Daily or once in two days, lectures in Kannada on the Indian folklore, and epics and legend ought to be delivered to the classes in simple homely language so as to rouse the imagination of the young student who ought to evince real interest in the national stories and begin to take pride in the same. This system of lectures on the folklore and Indian epics and stories would alone rouse interest in the young minds and appeal to their imagination. Side by side with this system of moral lectures and story—telling, a regular lesson in *Amara* “that immortal Poetical Dictionary,” ought to be given, as that alone would train the memory. If the primary education does not aim at training the young minds on national lines, does not arouse in the students real pride and love for the Indian heroes, if it does not *train the memory* at a time when it could be best trained, and if it does not teach the boy enough to read and write Kannada and

calculate fairly well the daily transactions, then such an education, given at so much expense would be a pitiable waste of so much time, money and opportunities. It behoves the Government and the Department to insist upon the Primary Education, being a real education not simply a farce and waste of four years. We have known instances of boys of the I and II standard not knowing half as much as boys of the old pial schools however unsatisfactory the latter might be in their working. Drill and Drawing and some visual instruction must make the primary Education a real and *efficient* one. Frequent inspections by efficient Inspectors who should see how and what the masters teach and what progress they make every month, would certainly improve the teaching especially if trained masters only are appointed.

One other suggestion, calculated to make primary education efficient and effective is the raising of the minimum pay of school master to at least Rs. 15. The present minimum deters many a young man from seeking service in this Department, Service in other departments is generally more attractive. Hence the initial pay must be something that would enable the masters to keep the body and soul alive.

Coming to Middle School Education:— This is the most important link between the Primary Education and the Higher education and as such it must be conducted on almost ideal lines. Physical mental and moral aspects of education must be properly emphasised in this course. Now that the middle school education has been made free, this ought to correspond to the liberal education so highly spoken of in the West. The curriculum must be comprehensive enough to provide proper choice to the urban and rural population according to their several aptitudes and opportunities.

The abolition of separate Kanarese Lower Secondary Examination would do irreparable injury to the cause of the vernacular of

the country, nay, would deal the death blow to the mother tongue. This suggestion from one who was a staunch Advocate of Vernacular University for the State, is ridiculously inconsistent and inexplicably mysterious. This modification of the Middle School course would work untold evil and is fraught with grave national danger. As Mr. Rees a foreigner has rightly pointed out, we shall be doing immense injustice to our mother tongue, instead of giving it the foremost place. Though you artificially make Vernacular the first language and English the compulsory second language, the latter will become the foremost and all important language engrossing the attention and interest of the student and engaging the serious attention of the masters and perhaps even of the Departmental authorities. Failure in Kannada in Lower Secondary Examination is even now exonerated and never regarded as a disqualification or a disgrace. In fact, those that fail in Kannada are put on the same level as those that pass in it, so far as promotion to the next class is concerned. Attendance and attentiveness in the Kannada classes are proverbially poor and the interest that English-knowing boys take in Kannada lessons is something not worth mentioning. The Kannada periods are regarded as a breathing space even by the earnest students of English schools. (Whereas failure in English is an absolute disqualification—an irreparable disability for promotion. When such is the importance attached to the English language, how could students be expected to devote serious attention to an obviously unimportant subject?) This is the inevitable fate of Kannada so long as it is placed side by side with English. This defect is not due to the language itself. For students in the Kannada Lower Secondary classes and Upper Secondary classes study the mother tongue as seriously as if they seek salvation through it. Whereas those that are privileged to study English go with a determined prejudice that Kannada texts

are easy and a study of the books could be made up just on the eve of the examination. Hence it would be quite desirable to put off this period of comparative indifference to the mother tongue as long as it is possible, and to provide a course of study in which the main attention and interest would be rivetted upon the vernacular. Making English compulsory along with the Vernacular would deal a double blow to the language, and to the *morale* of the student population. We could be unconsciously and innocently encouraging the unjustifiable contempt and disregard for the Vernacular and that at a very early and impressionable period of a boy's life, if we should ask the boy to study both English and Kannada as compulsory languages. We would be indirectly responsible for the growth of un-national instinct in boys. It is very curiously suggested that the spread and growth of the language will not be hampered by this system and that the progress of the vernacular may be safely relegated to the tender mercies and good sense of a few of the educated men who may perhaps take a spasmodic interest in the growth of the Vernacular. We might assure the proposer as well as the public that what we want is the spread of the vernacular as a popular and living language as much as a literary language. And this can rarely happen if you stifle the love for the Vernacular even in your scholastic course and relegate to a secondary importance.

The effect of this proposed policy on the village and rural population is obvious enough. As Mr. Rees has said, as soon as a boy begins to know a smattering of English, his ideal would be to look with undue contempt upon the villagers and village life. We have launched upon a grand policy of spreading education and dispelling ignorance but not of destroying everything that is noble and useful of village life. Villages and villagers are as much necessary as cities and perhaps even more so. We can

have no justification in endangering the growth of sturdy village life and rural industries by giving effect to our dreamy and airy notions of equality. The criterion determining the policy must be—not what the irresponsible people want but what is best and necessary from the point of view of higher interests of the State. The educational policy must aim not so much at unification as at the greatest good of the greatest number.

There seems to be something fundamentally wrong in the educational policy which proposes this abolition of the Kannada Lower Secondary Examination and unifying the middle school course, by making both the languages diametrically opposed to each other in every respect, compulsory. Knowledge of English is not necessary for our ordinary village and even urban life and transactions and industries; on the other hand, it would be a decided obstacle for the healthy growth of village life. What is wanted is some education that would enable people in general to come out of rank ignorance and to understand the world. It would be a serious blot and a monstrous libel on the vernacular to say that it cannot serve the purpose of general education. We must not encourage our people in general, and villagers in particular, to think and act and speak in terms of English and English standards. English ought to be the medium of higher instruction and as such its knowledge would be essential only for those that devote themselves to Higher and University Education. But let not the mania of Higher Education overpower the people in general, and make them fritter away their energies in an undesirable and futile attempt to go to higher literary education. If you make English compulsory at an early stage, no one will think of our necessary rural industries, no one will think of taking to agriculture, no one will think of living in the villages, and every one will think either of becoming a quill driver or of entering upon

higher literary education, a task admittedly beyond the reach of every one.

The physiological and psychological effects (evil effects of a study of two unconnected languages at an early stage) have been ably, effectively and earnestly reiterated by all acknowledged authorities on education both in the West and in the East. But here, in this Model State, we find an abortive and unnational attempt of forcing every one, who advances beyond the primary stage, to learn both languages. Much of this policy seems to be the outcome of a slavish attempt to copy the English system originated by those who profess to have first hand knowledge of that system without understanding the fundamental differences in the temperament and character and needs of two people. Even Mr. Fisher, the greatest authority on the *English system of Education* and certainly not an authority on the needs and wants of the Education in India—has not forced upon the people a study of two unconnected and opposite languages neither of them a classical—one compulsory.

The unification of types in the Middle School course is a very charming and attractive dream to the unthinking mind and rousing as it does the imagination of only the masses, it does more good to the heart than to the head of the originators and admirers and apologists of the scheme. At the best, it is perhaps a well-meant, but most certainly an ill-judged scheme. Physiologically or psychologically, from the point of view of the spread of the Language and of the growth of a healthy national and rural life and spirit, it is most unsuited and positively mischievous. The only thing commendable about it is, the appeal to the heart and imagination of the people in general. If the paternal and benevolent Government of His Highness the Maharajah is actuated solely by national spirit, if it considers the interest and good of the nation more important than the clamour of a few people, if it wants to bestow proper regard to the growth and

spread of the Vernacular, if it does not want to deplete the village and destroy the useful village life and rural occupations, if it does not want the manufacture of men unfit for anything else except clerical and Government service, it behoves the Government to think twice before introducing this scheme of making dual languages compulsory and abolishing the longstanding and really useful Kannada Lower Secondary Examination.

One other inevitable consequence of the proposed scheme would be the lowering of the English Lower Secondary standard by attempting to adjust the Examination to the needs of the thousands that blindly seek it, whereas High School experience—which neither our I. G. of Education nor our Secretariat officers profess to have—shows how difficult it is to make the large number of the IV form standard students follow the instructions given therein. Another very serious consequence, unfortunately lost sight of, by the Educational Department which has proposed this scheme, would be the difficulty of obtaining suitable teachers for the 10,000 Primary and purely Vernacular schools. An English Lower Secondary passed candidate who has plodded on for a few months the High School course is just the most unfit person to undertake the really arduous task of teaching the villagers. His little knowledge of English is really dangerous to the village life, besides being superfluous. It is admitted on all hands that the most discontented man is the one, who has made some progress in English Education. The poor salary offered in the village schools combined with an unhealthy spirit of discontent in the teacher, would make teaching in the primary schools most inefficient and ineffective.

We may be accused of offering all the while only destructive criticism without offering any constructive suggestions. We have suggested already that the primary course—a purely vernacular one—should be of four years. We insist upon retaining a dual

type in the middle school course and not sacrificing everything for the high sounding name of unification. The Vernacular Lower Secondary Examination course must be one of three years. Suitable provision must be made in this course for the provision of subjects consistently with the usefulness for and aptitudes of, the rural and urban population, by making agriculture or one or two of the rural occupations optionals in the rural schools, and some industry and drawing optional in the urban schools. To provide an opportunity for students to go to English Education, English must be taught in this three years Vernacular course; but this must not become an examination subject. It must be only a subsidiary subject taught just to enable those that care to take to literary education, but by no means a prominent or compulsory subject. Those that pass this Kannada Lower Secondary Examination may be allowed to appear for the English Lower Secondary Examination, after one year's course and tuition of English subject only. The English Lower Secondary course must be one of four years, one year longer because it involves the study of an additional difficult subject.

Subjects for these two examinations would stand thus:

Kannada Lower Secondary Examination (3 years.)

Compulsory:—Kannada language or Hindustani.
Mathematics.
Indian History and Geography and any two optionals.

English Lower Secondary Examination (4 years course.)

1. English language.
2. Kannada language.
Compulsory:—3. Elementary Mathematics.
4. Indian History and Geography and any two optionals.

Hygiene, Agriculture or one of the rural occupations; (c) Industry such as carpentry, painting, basket-making etc.; (d) Sanskrit or Persian or Kannada in the case of Urdu students; (e) Mensuration; (f) English or Drawing and Drill and Moral Lessons being non-examination subjects.

Medium of instruction should be entirely Kannada and boys should answer the subject in the vernacular except in the subjects 1 and 3 of the English Lower Secondary Examination. Kannada Lower Secondary students in the English Lower Secondary must be given special coaching in English, instead of the other subjects in which they have passed. This scheme has all the advantages of the reformed scheme and none of its disadvantages. It only lacks the name of unification of type, but it is by no means revolutionary.

Coming to the High School course, we quite appreciate and endorse the views and suggestions of our enthusiastic I. G. of Education, especially his Polytechnic course which is calculated to make the students real practical men well equipped to enter life and earn a living. The twofold ideal of High School education, to fit a man to earn a living and perhaps to take to higher education: is well worth attaining, and whatever tends to attain this ideal is really welcome. The humanistic and practical and at the same time the literary aspect of Education must be well emphasised in the High School course. English must continue to be the medium of instruction till our vernacular literature grows and is well abreast of modern ideas and modern science. Western knowledge and western literature and science is indispensable in any system of sound education, and till we can have books in abundance in the vernacular on these subjects, to think of making the vernacular the medium of instruction would be simply losing sight of the real aim of education in our eager desire for reform. Though English should continue to be the medium

of instruction, every incentive should be offered and every effort encouraged to spread the vernacular literature.

The School Final system seems to have a tendency to make the students as well as teachers more and more mechanical, to bring into prominence the dull average instead of emphasising the importance of superior intellect and mental faculties. "Some education for all and the best education for the few" must be the key stone of all educational policy and this must be well emphasised in the High School course. The system of weekly lists should be well nigh abolished, the system of giving notes and cramming up undigested matter must be strictly prohibited, and arrangements should be made to introduce an efficient system of lively discourse and conversation followed by short lectures on the subjects concerned, and special attention should be paid to make the teaching and the lessons systematic. Students of late seem to think that the teacher will do everything for them and will prepare the lessons and give them ready made pills to swallow up while, they, most of them go to the classes with a vacant mind absolutely unprepared to receive instructions in the class. Particular emphasis must be laid on the students as well as teachers going prepared to the classes, and every student must be made to write a synopsis of what has been taught in the class. The conversational part of the teaching is meant to test how far the students have understood the previous days lessons and how far they are prepared to receive the new lessons. Divided responsibility in any subject is a most pernicious and inefficient system, and as far as possible only one teacher must be held responsible for one subject in any class.

The principle of making Indian History and Geography compulsory non-examination subjects is a mockery and thousands of students there are that profess to have passed out the examination without knowing the elements of these subjects. These must be

made really compulsory subjects and students must be examined in these subjects in the public examination. At present, there is no systematic study, no systematic instruction and no systematic course so far as these subjects are concerned and it is to be hoped that the department will give a proper place to these subjects in the curricula so as to attract the proper attention of the students and teachers.

The system of non-detailed text-books and their study in the IV and V forms seems to be doing no good to the students. The books selected are shabby and the information contained therein meagre and they form at times murdered and mutilated abridgment. The outlook of students is necessarily narrowed inasmuch as they never even glance at the non text-books and the study of general books receives absolutely no proper attention and importance.

How far the introduction of Pedagogue's as an optional has borne fruit one fails to see. To expect a fellow to specialise in teaching and that only theoretical teaching, when he has not had the necessary amount of general education as is offered by the High School course is a wild dream. Teaching is of course technical but not so technical as to be managed without at least the minimum amount of general culture. Even Mr. Fisher, the great authority on Education in Britain, seems to have recaptured the futility and unwisdom of introducing this subject at such an early stage. Let a man come out of the school final course, equipped with the minimum amount of general knowledge, and then if he cares to take to teaching, insist upon his undergoing training and acquiring proficiency in theoretical as well as practical teaching.

Special merit and high order of intellect and superior mental faculties should ever receive a premium and special encouragement and inducement should be offered in recognition of merit. The system of awarding prizes was intended chiefly to reward

special merit. That system should be continued in no halting manner. If we encourage men of merit and superior talents we shall be increasing the national asset of the country. Thus while it is fair to create equality of opportunities to one and all to advance in education, we shall be doing a great national injustice should we fail to recognise and reward special merit quite uninfluenced by any other consideration. The only motive of the Government in rewarding superior intellect should be the eager desire to add to the invisible national wealth.

A word more about the school final system. The principle of moderation of marks and the basis of the dead average works hardship upon the really intelligent students. The examination must try to ascertain the absolute merit of a student and those that obtain the passing minimum must be declared to have passed irrespective of their performance in the class. The class marks should come to the rescue of a student who by chance may not obtain the passing minimum. There have been instances in which the principle of moderation has worked great mischief in undoing those that perform well in the Public Examination. It is hoped that such an anomaly will not be permitted to repeal itself.

The dissociation of practice from theory is nowhere so conspicuous as in the declaration in the Memorandum that the Hostel system should be encouraged and the recent orders of the I. G. of Education withholding grants to some of the recognised Government hostels. The principle on which the Government hostels attached to the High Schools in the State are abolished does not appeal to common sense. By all means private effort may be encouraged; but why the recognised hostels that were the refuge and not the place of charity for the many seekers after knowledge in out of the way places should be discontinued is beyond comprehension. In these days when special importance is attached to all round education,

mental, moral and physical, when the development of a sound body is regarded as much necessary as of a sound mind and of a sound soul, to abandon students who are exiled from the wholesome influence of a home to the whimsical mercies and mercenary care of private hotel-keepers would contribute to the physical degeneration, utter neglect and ill health of the rising generation of students. When residential system of education and Boarding Schools are the order of the day, when the modern education pretends to develop the character of the student quite as much as his mental faculties, when the teaching authorities are expected to mix as far as possible with the students and watch their movements, what possible justification or plausible argument can there be brought forward to exonerate the step the department has taken. The public sincerely trust that the Government will act up to the situation and revive the hostel system.

That the training college should be better equipped and better staffed, and be brought under the fostering care of the University is an absolute necessity. All our educational programme would be an idle waste and mockery if we don't bring in better trained and equipped men to the work. The people that undergo graduate training in the present institution carry no status with them in the estimation of the public. If it is made a University Examination, if training is left to the hands of able professors, and if the institution is better organized and controlled, it is bound to attract many more young men. Every graduate teacher must be made to undergo the improved training, and raw recruits should no longer be appointed to educational service before they have undergone training. Even those that have had training and are in service must be required to revisit the ideal institution partly to brush up their long forgotten or long acquired knowledge, partly to make themselves more up-to-date and methodical, but chiefly to give the benefit of their experience and offer suggestions

regarding the method and organization of teaching. The training college must be a central laboratory for experiments in the system of education. The lack of a Teachers' Guild in this model State speaks volumes about the kind of men recruited to the Department, the kind of encouragement and treatment the Department gives and the spirit with which teachers take to work. While we are thankful to the band of self sacrificing teachers and while we mean no disparagement to the existing tutorial staff, we must point out that the Department is not attracting first-rate men, and that it has come more or less of a refuge to people that are disappointed elsewhere, and that the department has not done due justice to really capable and earnest teachers who perforce give up the sacred profession.

There is so much talk of the Civil Service re-organization, Police and Excise service re-organization, but not of re-organization of Education service. If this department can't offer as good prospects as other departments, how can we be sure of attracting able men. The proposed alteration of salaries and grades is not at all satisfactory. The old 200-20-300 Rs. grade must be continued and special places in Rs. 350 and Rs. 400 grade must be reserved for the Head-master's places in the Collegiate High Schools. The Assistant master's grades in the High Schools and those of the Assistant Inspectors must correspond to the grades in the secretariat, *viz.*, 50-5-100 and 125-10-175.

The needless and frequent change of textbooks by the Department is a positive nuisance and must be scrupulously avoided. Many of the books prescribed are not fit even for a light study in 'the summer share' or by the 'winter fire-side.' Most of these books contain "baby talk" and "booby information." Why the unfortunate parents of school-going students should be penalised for the ignorance or indifference of the prescribing authorities is hard to understand. Experience and up-to-date methods would

perhaps necessitate a change in the system of teaching but not necessarily of text-books.

From the Education Review it is clear that out of the 257,601 students in primary schools only about 800 or 3 per cent reach the Collegiate class and the output of graduates calculated from these is only '01. This proves the necessity for educational organization to absorb boys who discontinue education at a certain stage either in service or in technical branches. It is also very desirable that an able educationist should be sent to London County Council to study the system of Educational Administration in all aspects.

In conclusion, recent experience of educational administration brings out prominently an awful confusion of principles, an unjustifiable overlapping of the spheres of the executive and initiating authorities, an utter disregard of public opinion, and an over centralization to an undesirable extent. The Government, through the educational secretariat must lay down the policy and the Department must strictly carry out without any comments of its own, and also supervise and maintain efficiency, and organization and co-ordination of the various educational institutions. It is no good that the Government should simply re-echo the suggestions of the Department. It ought to reserve the initiative entirely to itself. For this purpose an experienced educationist who was himself a teacher and who has had personal experience of teaching must be selected to be the Education Secretary. And an Educational Board fairly representing public opinion and expert opinion ought to be constituted to lay down the policy and to correct and check the possible vagaries of the executive. Then only can we work out a really democratic programme of educational policy in a really democratic and not autocratic spirit.

V

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PRIMARY EDUCATION.

The defects of the existing schools and of the compulsory system of Education are not, after all, so great as one might be led to imagine them to be from the severity of the criticism to which they are subjected. It must be admitted, however, that ideal perfection has not been aimed at in the organization and distribution of schools, nor has ideal justice been the aim in the working of the Compulsory Education scheme. The existing school represents the results of attempts made from time to time to adopt the existing type of school to the growing requirements of the locality. It is the existing Upper Primary School that is now recommended for adoption as the new single type school. Minor alterations were permitted to be made in the original type, when such appeared to be necessary. Thus one or two higher classes were added where the growth of a school justified such addition. Where there was a demand for English education, English classes were opened, the villagers paying in advance a year's contribution which they recovered from fee collections. When a new school had to be opened, as in the case of thousands of grant-in-aid schools of 1914, it was permitted to begin with only one class, the lowest, as nothing else could be done in a village which had a school for the first time. When the Practical Instruction Scheme was introduced, classes for practical instruction were opened in a few selected schools. When each of these changes was introduced, the limited resources at the disposal of the Department made it impossible for it to make any attempt to adopt the new arrangement at once in all the existing primary schools.

It is proposed to maintain in future ten thousand Primary schools of one type with four classes. An intelligent boy entering school at the age of five—the age at which Indian boys are generally sent to school—can complete the four years' course by the time he is nine. This aspect of the question has to be considered in connection with the scheme of compulsory education. It is perhaps advisable to restrict admission to those who have completed their sixth year. It is also a point for consideration whether among more than nine thousand villages which are to have only a Primary school, a few hundreds at least will not, in course of time if not now, aspire to have reasonable facilities for the higher education of boys in their own villages. In cases of real need, the Department should be prepared to open secondary classes with optional English or Industrial courses.

THE GRANT-IN-AID SYSTEM OF 1914.

This also has come in for some severe criticism. It was the slow progress that primary education had made in the past and the difficulty of finding all the funds required to give it the impetus which it very much needed, that suggested the bold experiment of giving the rural population an opportunity of indicating how far they were willing to co-operate with the Government in their desire to bring about a rapid extension of elementary education in the State. It was believed, not without reason, that the villagers preferred paying a portion of the cost of educating their children, to waiting until schools could be started in their villages at the entire cost of Government. The results achieved have surpassed the most sanguine expectations. Thousands of schools have been started. All promising schools have to be retained and their wants supplied.

COMPULSORY EDUCATION.

Much stress has been laid on the injustice caused to the rural population by the introduction of the compulsory system of education in towns and cities in preference to

rural areas. A beginning had to be made with towns for more reasons than one. It was easier and far less expensive to introduce the principle of compulsion in a town than in a rural area. The additional number of children for whom provision was required was much smaller in a town than in a rural area. Buildings and School Committees of persons capable of dealing cautiously with new conditions, could be secured more easily in towns than in rural areas. Children who would have to attend under the new regulation in towns, were mostly children of artisans, labourers and mendicants who live almost exclusively in towns and who till now have made scarcely any attempt to educate their children. It will hardly be disputed that when any new arrangement of a complex character is to be introduced it is best to introduce it in localities where there is the greatest chance of its being worked successfully.

If the limit of compulsory age is to be raised, apart from the difficulty of providing for a large increase in expenditure, a difficulty greatly increased by the abolition of fees in middle schools—the difficulty of finding adequate accommodation and staff would have to be considered. It would be best, therefore, to defer the consideration of this question to a later date.

SECONDARY EDUCATION.

For Secondary Education it is proposed to have six hundred schools all of one type in which English is to be taught as a compulsory second language. More than one hundred of the existing middle schools are for girls and they had in them in 1916-17, one thousand and fifty girls in classes fourth and fifth, giving an average of ten girls to a school. Several of the schools could not have more than half a dozen pupils in classes fourth and fifth. Whether it is not a very difficult task to maintain a school for half a dozen elderly girls, some of the schools being Hindustani schools, when an adequate number of women teachers capable of teaching

English cannot be secured for them, is a matter which requires careful consideration. For the conversion of two hundred vernacular middle schools into Anglo-Vernacular middle schools, four hundred teachers capable of teaching English up to the Lower Secondary Examination standard are required. How teachers with satisfactory qualifications can be found for these when in the existing two hundred Anglo-Vernacular schools there are barely one hundred and fifty teachers who have passed an Examination higher than the Lower Secondary Examination, is a problem deserving the most careful consideration. The minimum qualification of a teacher teaching the two highest classes in an A. V. School should be the old F. A. or Intermediate Examination or the present first year B.A. Examination. In the two hundred A. V. Schools in 1916-17 there were 8 graduates and 12 F. A's. The matriculates numbered 130 and 352 had passed the Madras Middle School or the Mysore Lower Secondary Examination. It is the common experience of Head-masters of High Schools that among the pupils admitted into the Fourth Form, boys coming from Taluk schools are, as a rule, inferior to those coming from schools at District Head-quarter stations. Therefore the number of vernacular schools selected for conversion into Anglo-Vernacular schools from year to year, should depend entirely on the number of competent teachers available for them.

The course is to be one of four years. It is very doubtful whether a four years' study of English, unless the subject is taught by very competent teachers, will qualify a pupil to follow with profit to himself the subjects taught in English in the High School classes. In the Maharaja's College and in the Maharani's College it was for some time the practice to give an extra year in the Fourth Form to a large proportion of pupils admitted into those colleges. Until, therefore, arrangements are made to give the option of taking the vernacular as the medium of

instruction in High Schools or to open a preparatory class below the Fourth Form in High Schools or it is possible to provide thoroughly competent teachers for all the A. V. Schools, it is undesirable to shorten the course in A. V. Schools.

It is suggested that exemption may be given to such pupils as do not desire to take up English in the Anglo-Vernacular schools. For such pupils some substitute for English would have to be provided. The most suitable substitute in Boys' schools would be Industrial subjects. It would, therefore, be necessary to train a sufficient number of Industrial Teachers before converting vernacular into Anglo-Vernacular schools.

In the list of Model Equipment for Secondary schools a Tellurian at a cost of Rs. 113 is included. A Tellurian is too complicated to remain in proper order for any appreciable length of time. Its omission, therefore, makes hardly any difference. Ball frames and kindergarten gifts and materials seem to be out of place in a purely secondary school.

MEDIUM OF INSTRUCTION.

Knowledge is acquired far more easily through one's own vernacular than through a foreign language. Full recognition is given to this principle in the Lower Secondary stage where all subjects except English as a language and Elementary Mathematics are permitted to be taught through vernacular text-books. If the High School courses are vernacularised, transition from the Lower Secondary to the High School stage does become easy, but at the same time transition from the High School stage to the Collegiate grade becomes difficult. Students who have studied Elementary Mathematics and Science through vernacular text-books, will find themselves severely handicapped when they have to grapple with English text-books in those subjects for their advanced courses in colleges. The difficulty will be even greater in the case of those entering Professional colleges like the Medical and Engineering colleges. It will thus be seen that while the

introduction of the Vernacular as the medium of instruction in English High Schools will be greatly to the advantage of those whose studies generally end with the completion of the High School course, it will operate as a great hardship in the case of those who use the High School course as a stepping stone to higher courses. The difficulty of replacing habits of studying and thinking through the vernacular by habits of studying and thinking through English, has thus to be faced at some stage and under present arrangements it is faced at the stage at which it can be most easily overcome. The course best in the present circumstances appears to be—to begin with the Government High Schools at Bangalore and Mysore where without dislocating existing arrangements some if not all non-language subjects, can be taught through the medium of the Vernacular in one or more sections according to need. If the arrangement proves popular, there can be little objection to its adoption in other High Schools.

EDUCATION OF GIRLS AND WOMEN.

It is an oft-repeated fact that the Education of women has not made satisfactory progress. One thing that can give a powerful impetus to higher education among girls more than any other, is the provision of an adequate supply of competent women teachers. While the percentage of girls in the Lower Primary stage exceeds the percentage of boys in that stage and is almost the same as that of boys in the middle vernacular stage, it is less than a half of that of boys in the middle English stage and less than a ninth in the High School stage. In 1916-17, there were 592 girls in A. V. I, 186 in A. V. II, 126 in A. V. III, 103 in A. V. IV, 109 in A. V. V, 14 in Form IV, 17 in Form V, and 16 in Form VI. These figures show that girls seldom go to school beyond a certain age unless they can afford to do so or are compelled to earn their livelihood. The latter class of pupils find the sanctioned scale

of scholarships ranging from Rs. 3 to Rs. 10 utterly insufficient to meet the cost of their education. Further there is little difference between the expenses of a girl in the IV Form and of another in the VI Form. A fairly liberal scale of scholarships seems to be, therefore, necessary if it is desired to secure an appreciable increase in the number of girls attending English Middle and High Schools. Some such scale as the following would appear to be adequate at present.

	Class or Standard	Number	Rate Rs.	Articulate live now
English	VI Form ...	20	15	1,350
	V Form ...	30		450
	IV Form ...	40		600
	III Form ...	60	8	480
	II Form ...	50	5	250
	I Form ...	40	3	120
Vernacular	U.S. First or Sec. year ...	25	12	300
	Lower Secondary ...	60	3	180
				2,680

or Rs. 32,160 per annum

TRAINING INSTITUTIONS.

The problem of the supply of teachers for Primary schools requires a little attention. For the ten thousand Primary schools it is calculated that more than seventeen thousand teachers will be required. The secondary school will be the only source of supply. Whether from among those that pass from the six hundred secondary schools a sufficient number will be available annually for employment as teachers, is a point for consideration. This difficulty also would point to the need for a large increase in the number of secondary schools.

In the arrangements proposed for the training of teachers, it is proposed to include 80 temporary classes for training pupil-teachers. The term *pupil-teachers* requires to be defined, as there do not seem to be any pupil-teachers at present in any of the existing schools. Here again the task of finding 320 teachers competent to give satisfactory training to other teachers seems to be not an easy one. If the best available teachers are shown away from the existing secondary schools, the secondary schools will be further heightened by this arrangement. It is not then, how four teachers having four classes each are expected to devote the time a teacher is required to train twenty teachers. When arrangements for training teachers on such a large scale are under consideration, it is very desirable that two or three enthusiastic head-masters of District Normal Schools should be sent on deputation to America to study at first hand for a period of about six months the organization and working of typical Elementary Schools and employed on their return in the work of organizing and supervising the training classes.

The main lines of research of the chemical section of the Madras Agricultural Department last year may be described in two words as 'Phosphates' and 'Malt.' "The importance of the first," says the Report of the Director, "lies in the fact that a crying need for almost all crops in Southern India is phosphoric acid, and that we have in the Trichinopoly phosphate deposits, an enormous potential store of this material though not in a form 'available' for the needs of the plant. Research is devoted to ascertaining how this 'availability' can be secured, and the problem is being attacked along bacterial and chemical lines. The work on 'malt' developed out of the preparations that were exhibited at the Madras Exhibition in 1917, and promises most interesting results, both from what the public usually describe as the scientific and the practical point of view."

FEMALE EDUCATION IN INDIA*

Introductory.

ON the 12th October, 1915, a memorial on the subject of the education of girls in India was presented to His Majesty's Secretary of State for India by an influential deputation. The memorial emphasised points which had long caused anxiety to the Government of India—the insignificant number of girls under instruction, the disparity in this respect of the condition of the male and female portions of the population and the consequent danger to the social well-being of the Indian community. It recommended the formation of a representative committee to enquire into the whole subject. Mr. Chamberlain, in welcoming the deputation and agreeing with it as to the importance of the subject, observed that similar representations had apparently not been made in India, indicated that the times were not propitious for the launching of schemes which carried serious financial consequences and left the question of a committee to be decided by the Government of India. The memorial was forwarded by the Secretary of State with his Public despatch No. 191, dated the 5th November, 1915. The Government of India deemed it preferable to invite local Governments to obtain the opinions of competent persons, local bodies, existing committees and other authorities and to forward them with an expression of their own views. The replies have been received and furnish a mass of valuable evidence upon a difficult subject.

It was the intention of the Government of India to place their views on this important subject together with those of the local Governments before the public by means of a Resolution. Various causes led them to postpone this action. The issues connected with the education of boys, which,

* Resolution of the Government of India, Department of Education, No. 1078, dated 1st Oct., 1919.

as explained in their circular letter No. 750, dated the 2nd September, 1918, had long been under consideration, the question of organization raised by the Report on Indian Constitutional Reforms, and finally the desire to await the views of the Calcutta University Commission, all these afforded ample reason for delaying their pronouncement upon so vital and so difficult a matter. Though these causes still to some extent operate, it is now possible roughly to forecast the influences which will affect education, and the Government of India are no longer willing to withhold their pronouncement upon the conclusions at which they have arrived. The replies sent by local Governments with their enclosures run to great length. It has, therefore, been decided not to reprint them, though it is possible that some local Governments may desire to publish them. The views of the Calcutta University Commission are now public property and an off-print of the chapters dealing with the education of women has been made.

NEED FOR ELASTICITY.

Even now those conclusions can be put forward only with the reserve demanded in a subject regarding which it is difficult to dogmatise for the whole of India. In their Resolution No. 301-C. D., dated the 21st February, 1913, the Government of India recognized that the existing customs and ideas opposed to the education of girls require different handling in different parts of the country and hesitated to lay down general lines of policy which might hamper local Governments. They contented themselves with commending five points for consideration. They adhere to those general propositions, which, especially that regarding the type of education to be imparted, will be found repeated in the present Resolution also.

CAUSES OF BACKWARDNESS.

The difficulties which retard the education of girls in India are too well-known to

require elaborate repetition. The Calcutta University Commission have emphasised those arising from early marriage, *purda* and the distrust of western education. In doing so, they have described the condition of things prevalent in Bengal. Not all those difficulties are found or at least found in an equal degree in all parts of India, in some of which, for instance, the institution of *purda* is for the most part unknown. But the *cl*ly tent to which obstacles arising from *tb*who causes, from conservatism, from *ideas*gula-caste, etc., influence the result, is *evi*arti from the fact that only 0.9 per cent of live Hindu female population in India and now per cent of the Mohamedan is under *acate* struction; while among Europeans *uted* Anglo-Indians, Indian Christians *m*-Parsees, the percentages are 23, 8.3 and 1.5 respectively. The paucity of educated *gir*he in the larger communities is a matter of profound concern to the Government, as it was to the deputation which waited upon the Secretary of State. The disparity between the numbers respectively of boys and girls under education constitutes, as that deputation remarked, a grave danger to social well-being. The problem is as yet hardly an educational one. It has its roots in the very fabric of society and only a radical change in the life, customs and ideals of the country will effect its solution.

RECENT PROGRESS.

Nevertheless the progress that has been made is far from negligible. The total number of girls at school at the time of the Education Commission of 1882 was 127,000. In 1915-16—the year in which the deputation waited upon the Secretary of State—it was 1,186,000 and in 1917-18 it was 1,264,000. Expansion in recent years has been partially checked by the effects of the war. But it is noticeable that in ten years between 1907 and 1917 the number almost doubled. In 1882, again, the proportion of girls to boys under instruction was 1 to 20. In 1917-18, it was 1 to 5.3. This expansion has been

due largely to the labours and enthusiasm of a number of philanthropic individuals and societies and partly to a gradual improvement in public sentiment in some of the urban areas. It is also largely due to the constant pressure and perseverance of the educational officers of Government, male and female, who in the face of much discouragement have maintained their efforts for the further development—sometimes in the face of apathy and suspicion. The question has been reviewed from time to time, as by the High Commission of 1882 and in the Government of India resolutions of 1904 and 1913. Schemes of expansion were requested of the local Governments in 1911 and 1913 and the subject has been carefully considered in recent years by the provincial governments. Conferences have been held, opinions collected, policies outlined, special committees appointed, new schools opened, new arrangements made for training and inspection and new subjects introduced into the curricula.

HOPEFUL SIGNS FOR THE FUTURE.

Thus the expansion in numbers has grown with enhanced rapidity in recent periods and the interest taken in the subject has increased. It is on the interest evinced by the public in the education of girls that future development primarily depends. As the Calcutta University Commission have pointed out, the paucity of private effort (as distinct from Government and missionary effort) in the matter of the post-elementary training of girls which characterises Bengal is not discoverable in all parts of India; and in the city of Bombay alone there are nine private high schools for girls. Indeed in some parts of the Bombay Presidency private effort has manifested itself in a remarkable manner. The success of two women's colleges in Madras is conspicuous and significant. Improvements in the quality of the education of the male sex are calculated to produce a corresponding influence in the attitude towards the upbringing of women. The

loosening in some areas of the joint family system will force younger women, no longer under the tutelage and often the conservative influence of their elders, to seek in education some equipment against the calls made upon them by a new environment. The gradual changes, social and economic, which are slowly permeating the country are bound to have their effect and will, in the course of time, more and more be reflected in public opinion.

EDUCATIONAL DIFFICULTIES.

Turning to certain characteristics of the educational system which are often regarded as inimical to the development of girls' education, it must be admitted that the influence of such defects as exist is very small in comparison with that of the larger causes which have been mentioned above and, with the disappearance of those causes, such defects are likely to find their own remedy. The chief difficulties which may be termed educational are the following:—

- (i) The difficulty of providing an adequate supply of competent teachers. Resort is still necessary, and is for many years likely to be necessary to the employment of foreigners and members of the domiciled community. Their services are expensive. Indian Christians are also available; but in many places, it is understood, orthodox opinion prefers instruction by members of the faith professed by the majority of the pupils. Hindu and Mohamedan women adopt the teaching profession only in small numbers. The employment of men in girls' schools is generally deprecated.
- (ii) The unsuitability of the curriculum. It is frequently asserted that the curriculum for girls too closely follows that for boys. Over

half a million girls are studying in boys' schools; and for these it is not easy to devise any suitable system. In secondary schools there is a tendency on the part of many parents to oppose any course save that laid down for the university matriculation. Elsewhere attempts have been made to introduce a variety of courses. The question whether these attempts go far enough is discussed below.

- (iii) The dominance of the examination system. This defect prevails only in post-elementary institutions and to a much lesser extent in middle than in high and collegiate institutions. But the extent to which, at least in Bengal, it affects higher instruction is forcibly pointed out by Sir Michael Sadler's Commission. Secondary education for girls, says their Report, "labours under exceptional difficulties in Bengal; it is surrounded by prejudices: it is distorted, even more unnaturally than the education of boys, by the malign influence of the examination fetish." The Commission "feel that the schools must be saved from the desolating domination of the examination system which now mischievously influences all their work."

In addition to these three main defects, there are others of minor importance. In the following paragraphs the different grades of education will be considered and suggestions made for improvement with special reference to the difficulties mentioned in this and in preceding passages.

PRIMARY EDUCATION.

More than nine-tenths of the girls under

instruction are in the primary stage. Of a total of 19,395 primary schools, 554 are managed by Government, 3,106 by local bodies, and 15,735 by private agency. Of these last, 13,067 are in receipt of aid from public funds. The Government of India have laid down the principle that local bodies should assume a more direct responsibility for the evolution and management of primary education. In their circular letter No. 873, dated the 19th September, 1916, they suggested the withdrawal, whenever this is reasonably feasible, of such restrictions as at present exist on the activities of local bodies regarding such matters as the provision of buildings, the hours of attendance, the grant of holidays, the rates of pay, the levy of fees, the disbursement of grants-in-aid, the creation and filling up of appointments, the punishment and dismissal of teachers and (subject to certain conditions) the opening and closing of schools. Difficulties have been anticipated by some of those consulted in the application of these suggestions to girls' schools. Some local bodies have not evinced much interest in the education of girls. There is a tendency to subordinate it to that of boys. Expert opinion is often lacking. On the one hand Government, on the other some special sort of agency, is regarded as a suitable organization for the management of institutions. The Government of India have carefully considered these opinions. Where Government already manages schools, they have no desire to see the system radically altered, since the existence of such institutions evinces the interest of Government in this branch of education and sometimes results in the maintenance of model institutions. Still less do they desire to interfere with privately managed schools, the good work done by many of which they are glad to recognise. But in view of the relation between boys' and girls' education, the advisability of engaging local sentiment and interest to the utmost and the policy of strengthening local bodies by the delegation

to them of large and important functions, the Government of India maintain that those bodies, already constituted as the proper agencies for the diffusion of elementary instruction, must continue to be such in the case of girls and that upon their enthusiasm and the capability for management which they display the future of girls' primary schools will largely depend. The same remarks apply to the divisional boards recently set up in Burma where there are no district boards.

NEED FOR THE CO-OPERATION OF LADIES.

At the same time the Government of India realise that local bodies, as at present constituted, may sometimes be found lacking in zeal for girls' education and in the particular experience which would enable them successfully to handle it. There is no objection therefore to the establishment of advisory committees or to the inclusion of persons versed in the problem of girls' education as supernumerary members on the educational committees to which local bodies ordinarily delegate some portion of their functions. It is desirable that in such matters the assistance of ladies should, so far as possible, be utilised.

LINES ON WHICH FUTURE EXPANSION MAY PROCEED.

The most important matter for consideration in the education of girls is its wider expansion. Recent legislation has placed new powers in the hands of local bodies in certain provinces. In Bombay, Bengal, the United Provinces, the Punjab and Bihar and Orissa some classes of local bodies can now elect for compulsory elementary education in the case of boys; and in Bombay and the United Provinces the provision for compulsion can be extended to girls. It is hoped that these measures will bear fruit. In the meantime, however, local Governments and local bodies would do well to collaborate in the work of surveys for expansion. The

Government of India are aware of the difficulties of the question. The grounds which lead to the opening of a Government or board school often consist in the belief that there is some demand for education at the centre selected. The results are sometimes disappointing and it is occasionally found necessary to close the school in order to obviate waste of funds. It is suggested that even at the risk of incurring expenditure which, in the first instance, might appear unremunerative, it would be well to create opportunities for education upon some systematised plan, such as the founding of a girls' school in every centre which contains a secondary boys' school, whether of the middle or the high grade. Other systems will doubtless suggest themselves to local Governments as guides.

INTEREST OF LOWER CLASSES TO BE SAFEGUARDED.

In order to obviate the possibility that educational benefits may in some places be monopolised by those classes of the community which have enjoyed the larger share of them in the past, it will be necessary to keep a watchful eye upon the interests of the depressed and less fortunate classes. It is to be recognised, however, that in some cases the feeling against association with certain castes is more strongly accentuated in the case of girls than of boys. Such feeling, if it were to be ignored in favour of the principle of free admission for all, might result in the occasional collapse of a school. While, therefore, it cannot be denied that maintenance or assistance from public funds involves the right of any child to admission to an institution, some reasonable discretion to be exercised in unavoidable cases must in practice be left to local authorities and the establishment of special schools for lower castes may be found necessary in some areas.

CO-EDUCATION.

Since no measure is to be overlooked which promises even a possibility of success

in prosecuting this most important object, the Government of India would emphasise not only the foundation of new schools, grant of scholarships, etc., but also the retention and, if necessary, the further development of other measures which are at present found in different provinces. Thus, over 500,000 girls study in boys' schools. The defects of such an arrangement are fully appreciated; but in default of more adequate arrangements, it seems desirable that facilities should be offered for small girls in boys' schools where girls' schools are not to be found. Such devices, however, can in no case be regarded as a substitute for the foundation of girls' schools and it is doubtful whether the offer of special grants for girls studying in boys' schools should be retained at any centre where a girls' school is opened.

ELEMENTARY CURRICULA.

The general practice hitherto has been for a local Government through its Department of Public Instruction to prescribe for adoption such courses as the department considers generally suitable, with or without a certain measure of latitude for local or individual needs. There is a good deal of public criticism of this arrangement on the grounds, *firstly*, that the courses do not allow sufficient variety and, *secondly*, that they are not properly adapted for the special use of girls. In regard to both these criticisms it is to be remembered that the bulk of the girls under primary education—over 95 per cent—are in the lower primary or most rudimentary stage of education, and that if, as is inevitable, they are first taught to read, write and figure in their own vernacular the margin for a variety of subjects either in the lower or in the upper primary stage is very narrow. The period during which girls are at school is very short and their attendance often irregular, so that out of the several additional subjects which are usually suggested for their instruction, it is impossible to expect that more than two or three at the most could be taught adequately in one school, even when teachers com-

petent to handle them are to be found, without hopelessly overloading the curriculum and subjecting to a degree of study incompatible with their physical powers even the few girls who proceed beyond the rudimentary stages. It is, however, the duty of Departments of Public Instruction to review from time to time the schemes of study so that these may correspond as far as possible with modern ideas and local opinion and to suggest for the higher primary classes a limited number of alternative courses. For the rest, the procedure laid down in the circular of the 19th September, 1916, already alluded to, should be followed. Account should be taken of the fact that any such alternatives are meant primarily for schools where girls alone are taught and of the varying needs of different classes and tracts and of town and country; and it would add to the authority of these schemes if they could be set forth after consultation with intelligent un-official opinion. The courses having thus been devised, the local bodies concerned would be at liberty to prescribe for the classes concerned—both in their own schools and in those to which they give aid—the particular subjects to be studied, provided, of course, that the staff possesses the qualifications necessary for the teaching of those subjects.

DESIRABILITY OF SPECIAL TEXT-BOOKS; AND OF RELIGIOUS INSTRUCTION.

Two special points arise in connection with the curriculum. It is a matter for consideration whether it would not be well to produce special text-books suitable for girls in the higher classes of primary schools. In some provinces the production of special text-books is believed to have been attended with success. Second, there is a growing feeling against the exclusion of religious teaching and observances from school life, and the feeling is more accentuated in the case of girls than in that of boys. In Government and board schools such teaching cannot ordinarily be given in school hours; but the codes in several provinces admit of

facilities for religious teaching out of school hours and when there is a demand for such teaching local arrangements may be made as far as possible to meet it. In Hindu schools the teaching of elementary Sanskrit, of tales from the epics or of religious music is often advocated with the object of introducing a religious element into the teaching. In schools predominantly Mohamedan, the reading of the Koran is demanded and facilities for this can generally be given. The Government of India are of opinion that it would not be advisable to lay down any uniform system to be followed in all localities in respect of religious teaching either for boys or for girls but they feel that in the case of girls a rather greater degree of elasticity can be given to the curriculum in this respect and local bodies should do what they reasonably can to meet genuine local sentiment in the matter.

SECONDARY EDUCATION.

Of the girls at school something less than 2 per cent are in the secondary stage, but the influence of this stage of education on the future of the country is very considerable and the problems which it presents are among the most difficult in the educational administration of the country. The management of the existing secondary schools is almost entirely in private hands, Government having but few schools of its own and local bodies fewer still, though the bulk of the schools receive financial aid from Government. In the case of boys, primary education is quite as much as local bodies can undertake. They may be expected to interest themselves in girls' primary education also. In these circumstances and for various reasons they cannot be expected to do anything substantial for girls' secondary education. It will probably be necessary, therefore, that the general control and supply of funds should rest with the Government, but this need not involve the management by Government of any large

number of schools. The working of secondary education among girls is a matter of some delicacy in which a special degree of elasticity and personal feeling is required which Government can seldom hope to provide as adequately as private societies or individuals, and the general form of management should as at present be of a private character, aided by funds from Government, and under Government inspection and control. It would seem advisable, where possible, to associate with the Education Department one or more advisory committees, consisting as far as possible of ladies, similar to that previously constituted by the Government of Eastern Bengal and Assam. Such committees would be unnecessary where secondary schools are under fairly effective managing boards, and the personnel of the advisory committees would largely be a repetition of that of the managing boards of the several schools. Efforts, however, might be made to induce the school authorities so to constitute their own boards as to render them, as far as possible, responsive to local public opinion as regards the character of the education to be imparted in the schools.

SECONDARY CURRICULUM.

There is no point upon which there is greater diversity of opinion than the character of the secondary education which should be imparted to girls. As in other countries, there are two main schools of thought. The difference between them is for various reasons more marked in India than elsewhere. The one school would bring up girls on lines as similar as possible to those laid down for boys and would prepare them for a university career. The other would prepare girls primarily for home life and hold that women should be educated in all that concerns enlightened mothering, a good standard of maternal physique, better care of infancy, appropriate feeding, care and management of children, effective attention to children's diseases, and generally to their physical

condition, good sanitary environment and other matters of domestic concern.

VIEWS OF THE CALCUTTA UNIVERSITY COMMISSION.

This question has been discussed at length in the opinions which reached the Government of India as a result of their reference. The Government of India have also had the advantage of the views of the Calcutta University Commission on this subject and on that of the collegiate education of women. The portions of the report of the Commission which deal with this subject are chapters XIV and XXXVI, together with certain recommendations in chapter III. The condition of things, which the Commission reviewed in Bengal, is not entirely reproduced in other parts of India, although the inadequate number of girls' schools may be regarded as a common feature.

TWO TYPES OF SECONDARY SCHOOLS RECOMMENDED.

The Commission recognize as already in existence two types of secondary schools. They suggest that in future schools should be so organized as to meet, on the one hand, the needs of the majority who will spend their lives in the *zenana* and whose education will cease at an early age and, on the other hand, those of the small but important minority who will take to professional service or play a part in the progressive section of Indian society. Both these types would fall under the general control of a body which the Commission call the Board of Secondary and Intermediate Education. It is an important part of their proposals that this board should generally manage the education now classed as secondary and also that which at present ends with the Intermediate examination. They propose, however, for schools for the former type of girls, (which they denominate *parda-nishin* schools) a special body acting under the board and consisting very largely of women. For girls of the

second type they consider that the maintenance of schools of the existing pattern will still be necessary and that the standard of attainment should as nearly as possible correspond with that of boys' schools. At the same time the subjects of the course might with advantage be modified so as to avoid too sharp a differentiation between the *parda-nishin* and the non-*parda* school. The Commission have recommended the creation of a standing committee on girls' education which would be advisory to the Secondary and Intermediate Board and which would frame the curricula and conduct the examinations for these schools. The Government of India have not yet fully considered the various proposals of the Commission. They recognize that the creation of *parda-nishin* schools will be a matter of difficulty and of very great expense and they do not overlook the obstacles which in some parts of India have stood in the way of what is now known as the system of *zenana* classes. They fully accept, however, the two principles which underlie the proposals of the Commission, namely, the modification of the curriculum in order to suit the needs of girls and women of different classes and secondly, the utilization of the advice of ladies in formulating a suitable system of instruction. They also heartily endorse the statement of the Commission that the *parda-nishin* school will eminently be a field for the munificence of enlightened Indians, without whose aid and encouragement schools of this type are scarcely likely to come into existence or to thrive.

EFFECT OF EXAMINATIONS.

The oppressive effect of examinations upon girls has been a matter of constant complaint. The Government of India endorse the view of the Commission that in the case of *parda-nishin* schools there should be some form of examination at the end of the course, but that it should not be compulsory and that it should be differentiated from the corresponding examination for boys and conducted in

part through oral tests by competent women visiting examiners; and that in non-*parda* schools it would be the duty of the Secondary and Intermediate Board to ensure that the standards of attainment represented by the examination correspond to those of the examination for boys, though this would not imply the use of identical papers, nor preclude the use of oral tests or the weighing of records of school work, which in view of the small number of pupils concerned would be specially practicable and easy.

IMPORTANCE OF MIDDLE ENGLISH SCHOOLS.

The remarks made above apply especially to high schools. But for a long time to come the middle school will represent an institution of great importance in the education of girls, seeing that in view of the paucity of high schools, the great expense involved in their maintenance and the social causes which still hamper progress, the middle school is likely often to remain the only institution to which the majority of girls who desire education above the elementary stage can aspire and beyond which it will be impossible for many of them by reason of social exigencies, etc., to proceed. Opinions are divided regarding the stage at which the teaching of English should commence. This is one of those matters in which the Government of India consider that respect should be paid to local opinion. It is obvious, however, from reports which have reached them that the value of English education among girls is much appreciated and they would strongly urge upon local Governments the advisability of establishing a close network of Anglo-vernacular middle schools which will provide women suitable for training as teachers of lower classes and will perhaps more than any other type of institution disseminate an interest in the advancement of girls' education.

COLLEGIATE EDUCATION.

The number of girls at present studying in Arts Colleges is 914. The Calcutta Univer-

sity Commission have declared that the intermediate classes do not properly form a part of collegiate or university education. If this proposition is accepted (and it had previously been put forward by various authorities in India) then the number of girls who are doing real university work is infinitesimal—in the three colleges in Calcutta the Commission found that there are only 53 students attempting such work. The Government of India, however, are impressed with the success (already mentioned) of the two women's colleges in Madras.

CALCUTTA UNIVERSITY COMMISSION'S RECOMMENDATIONS.

Among the recommendations of the Commission are the following. In view of the small number of girls concerned, the work of the intermediate and degree stages might continue to be carried on under the same direction and by the same teachers, though, so far as possible, the intermediate work should be done by school methods and should also be developed at some selected high schools. There is need for inclusion in university courses for girls of subjects which are likely to appeal specially to women. A Board should be constituted in the reorganized University of Calcutta on lines (similar to the standing committee advisory to the Board of Secondary and Intermediate Education), which would organize the provision of advanced education and make proposals regarding the adaptation of the degree courses to the needs of women, subject to the approval of the academic authorities of the University. On the difficult subject of economy in university training for women the Commission emphasise the need of co-operation among the colleges. They consider that, while university classes should as a matter of principle be open to qualified women students, under existing circumstances such facilities will be very little used. The conditions which prevail in Bengal in this respect are not to be found in

all portions of India. In Bombay and elsewhere a certain number of women study in men's colleges and this is particularly the case in professional colleges. The Government of India, however, fully realize the desirability of instituting separate collegiate institutions for women staffed by women, but with arrangements, if necessary, for lectures in certain subjects by the professors of neighbouring men's colleges. Their views upon the other recommendations of the Commission must naturally await the consideration of the Commission's proposals for university education as a whole:

TRAINING OF TEACHERS.

It is desired on all hands that schools should be staffed by trained women teachers; but the number of Indian ladies who are willing to teach or capable of doing so is yet limited. The number of those under training has indeed shown an appreciable increase during recent years and now stands at 3,096 as against 2,234 in 1915. These numbers, however, are altogether inadequate. It is, therefore, often unavoidable to employ to a large extent the services of mission societies of English ladies specially recruited and trained, of members of the domiciled community and of Indian Christians. The labours of these classes of workers are responsible for much of the progress which has already been made. Naturally, however, there is a feeling in many quarters that Indian girls should be instructed by those of their own race and creed. A considerable number of European ladies at present employed in education in India are actually engaged in the preparation of Indian women for this profession.

SOURCES OF SUPPLY.

The Calcutta University Commission recognize that women teachers of two types are required—those capable of doing high school work and of teaching through the medium of English and those who teach in primary schools and the lower classes of

secondary schools. The Government of India consider that the supply of the second class of teachers will best be met from among the pupils of the middle schools which they would like to see established after the pupils have undergone a supplementary course of training; and from the widows' homes which have been established in several parts of India. These sources of supply, however, should not be utilized to the exclusion of the existing training schools, which, on a limited scale, are doing most useful work.

As regards teachers of higher type, the Commission recognize that, if their programme of development is to be carried out, the necessary recruits can at present only be obtained from Britain or America. This remark, however (written in application to the Presidency of Bengal, though undoubtedly applicable to a large degree elsewhere), is tempered by the recognition that the more orthodox section of Indian society fears the unsettling influence of western women and that for the *parada-nishin* type of schools there must be a large increase in the number of well-educated Indian women teachers. The Government of India are fully alive to the advantage of supplementing the efforts of Government by the service of competent private bodies in the task of training women teachers. They incline also to the view of the Commission that this work should not be treated as apart, that it can be carried on as a portion of the ordinary teaching work of schools and university courses and that education may fitly form a subject in the courses leading to the intermediate and degree stages. In this connection, the following passage from chapter XXXVI of the Commission's Report is quoted:—

"We would suggest (1) that post-graduate classes in the university department of education which we shall propose should be thrown open to women equally with men; (2) that education should be introduced as one of the subjects for the degree, and that

instruction for this purpose should be provided by the three Calcutta women's colleges in co-operation; (3) that an introduction to the methods of teaching should be also made one of the possible subjects at the intermediate stage, as has already been suggested in the case of intermediate colleges for men, and that this option should be offered in all the women's colleges; (4) that training for the L. T. diploma and for the B. T. degree should be given in the women's colleges on a co-operative system, under the direction and advice of the university department of education, which might afford much assistance."

PROFESSIONAL TRAINING.

Apart from the training of teachers it has been recognized by many authorities, including the Calcutta University Commission, that the profession, in which there is greatest need for women is the medical. After discussing the difficulties of the situation and the proposal, now abandoned, to exclude women from the Calcutta Medical College, the Commission conclude that all the existing arrangements are little better than makeshifts and that until Hindu and Mussalman society has materially modified its attitude on the training of women no real solution for this problem will be possible. They consider, however, that one obstacle should be removed, namely, the difficulty of obtaining the requisite preliminary training. While it would be very expensive to provide this in any single college it might be possible to make use of some of the teachers in the laboratories provided for men in the preliminary medical subjects. These suggestions are endorsed by the Government of India and the attention of the Governments both of Bengal and of other presidencies and provinces is invited to them.

CONCLUSION.

In some of the opinions received by the Government of India it is contended that the progress of female education is not primarily a matter of money but of social development and it is urged that in many

cases schools have been opened but have failed to attract scholars. By many others it is held that the expansion of girls' education is mainly a matter of finance and that if only more money can be spent on schools and on the training of teachers the number of scholars will rapidly advance. There are doubtless parts of the country in which the former of these views is a correct representation of facts. There are tracts, however, where substantial sums of money can be spent usefully in starting new schools, in strengthening the Inspectorate, in experimenting with widows' homes, secondary schools of the types described above, and the like. Where anything can be done by the expenditure of money in such cases it is hoped that local Governments and local bodies will be liberal in doing what their resources permit. At its present stage the education of girls needs more financial fostering than that of boys: primary education must mainly be free; scholarships and studentships must be given more lavishly; grants-in-aid must be calculated more generously; and the greater expensiveness of secondary education has to be practically recognized. For part of the expenditure involved it is hoped that private endowments may be forthcoming, and so far as public money is required the responsibility rests primarily with the provincial governments and the local bodies concerned. The Government of India have of late years given considerable grants to help in various educational activities, more especially in primary education and the training of teachers and the utilization of these grants is by no means confined to the education of boys. But since the impending changes in the relations between Imperial and Provincial finance will in all probability involve the complete dissociation of the former from educational expenditure in the provinces, the provincial and local agencies will become not merely primarily but exclusively responsible for the future development of the

education of girls. It will rest with them to decide how far they will be able to devote public money to furthering this form of education, and it is hoped that the suggestions which have been put forward in the preceding paragraphs will be of assistance in indicating the objects on which such money can most usefully be spent and the directions in which the education of girls can most profitably be guided. Hitherto the difficulty has often been not so much in the actual provision of funds as in the discovery of opportunity for their fruitful expenditure. There can be little doubt that in future such opportunities will largely increase. Although it has to be admitted that the total number of girls under education is at present infinitesimal, the progress made in the last few years is significant, the interest now evinced in the subject is a hopeful sign and the enhanced rate of development in the education of boys, especially in its higher branches, is bound to influence favourably the popular attitude towards the education of girls. There is every reason, therefore, to hope that the demand for girls' education and the supply of means to foster its growth may in the future so react upon each other as to provide for an early and substantial development of this important factor in the progress of India.

• It is announced by the Government of India Department of Commerce and Industries for general information that all restrictions on the export of mica have now been removed. Exports of all sizes and qualities are now permitted without licence to any destination.

SALVAGING THE SCRAP HEAP.¹

BY JOHNSON HEYWOOD.

AFTER everything possible has been done to prevent making scrap, it becomes necessary to realize the greatest possible value out of such material as has found its way to the scrap pile.

This can be done in one of three ways, depending upon the product and the nature of the scrap:

1. A way may sometimes be found to utilize the waste material in the product.
2. New products may be added for which the scrap can be used as the raw material.
3. Steps may be taken to make the scrap worth more when they are sold.

The way one shop utilised its cast-iron chips and borings is an example of the first method. It had been the custom to dispose of this waste to the junkman, but when the price of No. 2 pig iron went to \$48 a ton, and the borings brought only \$8, even before freight was deducted, a serious attempt was made to remelt this scrap in the shop cupola.

It was soon found, though, that chips and borings thrown into the cupola buried up instead of becoming molten. All castings poured from a mix containing even 5 per cent of such borings were either badly pitted or else filled with spots so hard that to machine them was impossible.

HANDLING CHIPS AND BORINGS.

The problem this shop faced, therefore, was how to heat the chips and borings slowly enough to cause them to melt, but not burn.

¹ With Acknowledgments to *Factory, the Magazine of Management*.

Borings could, of course, be heated separately from the pig and scrap iron in a small blast furnace, but the additional cost of this double handling made the method inadvisable.

It was decided to put the borings under pressure and press them into a solid mass resembling an ingot, so an experimental press was rigged up. A hollow steel container about 20 inches long, with an inside diameter of 6 inches, and open at both ends, is secured to a movable slide, which keeps the container always centred below the ram which is attached to the headblock. A steel slab, $1\frac{1}{2}$ by 7 by 15 inches, in one end of which is a circular opening, $6\frac{1}{4}$ inches in diameter, is so placed on the ram-cap of the press that either the opening or the solid end may be slid under the container.

This container is charged by means of a sheet-metal hopper which contains several hundred pounds of chips and borings. The flow is actuated by gravity and controlled by a simple sliding gate. After the container has been filled, a small quantity of salt water is added and the contents rammed by hand. Pressure of approximately 6,000 pounds to the square inch is then applied. When compression has ceased the pressure is removed, the steel slab on the ram-cap moved so that the opening in the slab is directly below the opening in the container. Pressure is again applied and the borings are forced out of the container through the opening in the slab to a receptacle below. The salt water causes rapid oxidation of the iron and in 12 hours the borings are dry, the mass hard and in a shape that is easily handled.

Borings in this form were made the object of several experiments, and a mix containing 25 per cent of pressed borings was poured with excellent results.

From this small and rather crude arrangement a 50-pound block is pressed every two minutes, or approximately seven tons a day, at a total labor and expense cost of \$1.10 a ton. When this method was first put into

effect, loose borings brought only \$8 a ton. Therefore, considering the total cost to be \$9.10 a ton, we have the following cost of the new mix containing pressed borings.

In an average daily "pour" of 30 tons, there is used:

55% No. 2 pig iron	... 16.5 tons at \$48 00=	\$792 00
25% pressed borings	... 7.5 tons at 9 10=	68 25
20% scrap iron	... 6.0 tons at 15 00=	90 00
100%	30.0 tons	950 25

Prior to using the pressed borings, the mix contained:

60% pig iron	... 18 tons at \$48 00=	\$864 00
40% scrap iron	... 12 tons at 15 00=	180 00
100%	30	1,044 00

This gives an average daily saving of \$93.75 by this simple plan.

Widely different in method but the same fundamentally is the way one automobile manufacturer used the packing cases in which some parts of his car are received. When he realized the great amount of good lumber being thrown out daily after these cases were unpacked, he drew up a careful set of drawings and specifications, and demanded that his supplier make all further cases to meet his needs.

He made slight changes in the dimensions, insisted that the cases be put together with screws instead of nails, and even specified the size of screws to be used and the exact location of every screw hole. When the accessory supplier received the specifications covering the cases, he agreed to ship in them but at a considerable increase in price.

PUTTING BOXES TO GOOD USE.

The automobile maker was willing to pay extra for them, for by simply disassembling the packing cases, he is now able to use the sides, tops, and bottoms for floor boards for his cars without performing an operation on them. They fit even to the screw holes and the screws come with them. Thus he not only is saved the expense of making the floor boards but does not have a lot of practically worthless packing cases to dispose of.

In a hat factory waste ribbon is now used to take the place of material that formerly was purchased.

After the band of ribbon is put around the crown, a bow is sewed on the left side as a finishing touch. This requires two kinds of ribbon—what is known as 11-line and 12-line—one for the banding and the other for the bow.

Ribbon for the bands comes in rolls of approximately six yards, which leaves over a piece from four to six inches long on each roll which ordinarily is either thrown away or collected and sold for scrap.

Investigation showed that this piece could be used in making the cross-piece of the bow in place of the bow ribbon which was formerly used. Since a roll of ribbon bands a dozen hats, it is now possible to use the waste piece on one out of every four hats. In this hat factory, which turns out a normal production of 200 dozen hats a day the year round, the saving is about 6,000 yards of bow ribbon in a year.

In some instances material is so completely wasted that the scrap or waste is not even visible. The sewer or the river is the scrap pile.

That is particularly true in those industries using acids, chemicals and sundry materials of that sort. The savings to be made by reclaiming them is often well worth while because of their ordinarily high cost.

WASTE OF ENAMEL.

A recent experience in an enamelware factory illustrates quite forcibly the undeveloped possibilities that often exist.

It was noticed that after the second coat of enamel had been applied, a girl wiped, with a wet sponge, the beaded edge of the various articles coated, so as to make it possible to apply an enamel of some other color on the bead.

The sponge was continually rinsed, and the enamel that had accumulated on it allowed to run to the sewer.

To prevent this, separate pails filled with water are now given to each operator, with instructions that she rinse her sponge in the pail. Several times a day the contents of the pails are poured into a larger receptacle. The enamel settles to the bottom, making it easy to siphon off the water.

A test was made for several weeks and it was found that 2'87 per cent. of the enamel used was reclaimed in this fashion. Furthermore, the enamel was ready for immediate reuse. It loses none of its properties.

Such a method is applicable to many industries. In fact, one superintendent says that in his business running water and the sewer are the greatest encouragers of material waste.

Quite similar is the saving of ink made in some printing plants. It may be worth telling to show how nearly universal the method is.

In large printing establishments the ink is "dipped" out of cans and applied to the ink plate of the presses. This "dipping" process almost invariably leaves a fraction of the ink, which is of a heavy consistency, in the can, around the sides and on the bottom. The cans can be soaked in a solution, which in turn is poured into a concentrating tub or larger can. When the ink has settled to the bottom the solution can be poured off and the ink used.

INTENSIVE STUDY BRINGS RESULTS.

Usually a little intensive study of the product, keeping in mind the waste, will show many ways of utilizing the waste. For example, there is the tinware manufacturer who punches the spouts for tea-kettles from the odd-shaped pieces of metal that come from the blanking presses. This same plant had been cutting sheets of metal into strips to bind its export cases, while at the same time strips made in the plant were being baled and sold as scrap, as described in the last article.

In a wagon factory a sawyer stood all day at his cut-off saw, making short pieces of wood out of long ones for spokes. In another part of the plant another man was cutting other long pieces into very short ones for another purpose.

The first operator could cut very few of his pieces exactly without waste. Every night the janitors carted out hundreds of short ends to the boiler room. And all the time these short ends could, depending on their length, have been used for any of a half-dozen parts that other sawyers were cutting from long lengths. This is not an uncommon occurrence elsewhere.

To-day each sawyer is given a list of the length of pieces used throughout the shop and he plans his cutting of each length with this in view. Practically nothing goes to the furnace now but sawdust and pieces an inch or two long.

It must be remembered, however, that sometimes it costs more in labour to use the odd left-over pieces of material than they are worth. This is easy to determine if the concern has a proper cost system.

Frequently it is desirable to take on a new line of product solely to use up the odd scraps of material that cannot be used in the principal product.

A glove maker, for instance, found that no matter how carefully his cutters planned to use up the skins, it was impossible to avoid leaving over great numbers of small pieces that could not be used in gloves. So he now makes them up into leather pen-knife cases, watch covers and small change purses and gets a higher price for them per square inch of skin than he gets for his gloves. Formerly these scraps of skin had absolutely no value.

A counterpane manufacturer cut from each corner of his counterpanes a nearly square piece of cloth, containing about 70 square inches, so that the counterpanes would fit around the bedposts. That is 280 square

inches for each unit of product and amounts to many hundreds of dollars a year in raw material. The corners were formerly sold to paper mills.

A few cents labor on each now turns them into babies' bibs and they bring nearly 100 times as much a pound of material as he formerly received from the paper mill.

PUTTING WOOD WASTE TO USE.

Farm implements and butchers' blocks may seem to be products too diversified to go well together; yet a farm implement manufacturer gets a handsome price for his wood waste in the form of blocks. The wood is all in very small pieces of high quality hardwood. These pieces are covered thoroughly with glue and compressed in heavy presses to make the butcher blocks.

Some furniture manufacturers use short ends and scraps of wood to make children's tops, alphabet blocks and other wooden toys. One showcase concern has a waste of a great deal of broken glass and small pieces left over after cutting. This is used to make leaded glass fronts for bookcases, as well as windows. There is as much profit in these leaded panes as in the regular product.

It is perhaps trite to refer to the often mentioned outlets the meat packers have found for the hair, hoofs and other wastes incident to manufacturing meat. But the fact remains that nothing which comes into the packing plants as raw material leaves as waste or scrap. It is all finished product which sells at a good price, whether it be lamb chops, fertilizer, porterhouse steak, hair mattresses, sweet-breads or violin strings. It might pay any manufacturer to visit a packing plant in the hope that he would be inspired to see new ways to utilize his waste materials.

The opportunity for taking on new lines of product to match the material wasted in making the existing one is present in nearly every industry. The trouble is that most manufacturers cannot be expected to know all about every other product different from

his own that finds a sufficient demand in the market.

Therefore it frequently pays to call in outside help. A few hundred dollars spent for the services of a consulting chemist will frequently result in finding a use or a profitable outside market for a seemingly useless scrap or by-product.

A gas company, for example, had a waste liquid analyzed and found it to be the basis for the new high explosive, TNT, and worth several dollars a pound. It had been going down the sewer.

A tanner had been allowing a waste product to go into the river until a chemist told him that it was a coagulant which is used in filtration plants.

Industrial engineers, too, are often able to point out uses for scrap because of their familiarity with other industries and their knowledge of the raw materials used in most products.

SELLING THE SCRAP.

This brings us to the third method of salvaging—that is to sell the scrap for the most that it will bring. As just shown, it is sometimes possible to find that the, to you worthless scrap is the valued raw material of another industry. That means that by selling it direct to those who need it, it is often possible to get a considerably higher price than the junkman will give.

For instance, spring steel of high quality is an expensive material to throw away. Automobile springs are pointed by cutting two triangular pieces from each end. This waste amounted to many thousand pounds a year, which as scrap brought comparatively nothing.

It happened that this spring maker employed an industrial engineer who had had experience in a farm-implement plant. He suggested that these triangular pieces of spring steel could be well used for the teeth of spring-tooth harrows. Negotiations were opened, resulting in a permanent agreement

that the harrow concern would take the entire output of spring steel scrap. It not only served the "purpose but the shape of the pieces saved considerable cutting and other labor in the harrow plant. This is one way to realize a higher price on scrap that must be sold.

A good deal of attention is being given in up-to-date plants to the reclamation of materials and supplies that were formerly regarded as useless scrap and which were sold at an insignificant figure. There are many instances of savings, secured by an intelligent study of this problem, which vary from a few hundred dollars in smaller plants up to the hundreds of thousands salvaged annually by some of the larger industries.

It is safe to say that no plant is entirely free from a constant accumulation of miscellaneous "junk," such as discarded tool steel, worn out shafting, broken castings, bolts and nuts with bruised threads, and a thousand and one things which are cast aside because they do not serve any useful purpose in their existing condition. An examination of the typical shop usually shows piles of such discredited articles lying under machines and in out-of-the-way corners, where they sometimes remain unmolested for years. Also many storerooms are simply junk piles of obsoleted or worn-out tools and jigs.

HOW JUNK IS HANDLED.

One plant has solved this problem by establishing an enclosure near the storeroom, where all discarded articles are delivered before any disposition is made of them. No foreman is allowed to retain in his department any tools, equipment, materials, or supplies which are not serving, or capable, in their existing form, of serving some necessary useful purpose.

All such articles are sent to the scrap room, where they are examined by the master mechanic. He determines their value and decides what can be salvaged and what must be disposed of as scrap.

The plant operates a repair department, where a number of machine tools are installed. Damaged bolts are cut off, or turned down or rethreaded; discarded pieces of shafting are selected for work requiring smaller diameters; broken drills are cut off and repointed; and an endless number of other articles are converted into useful forms.

Here again judgment must be used, for it is easily possible to spend more on reclaiming the scrap than the tool would cost new. A simple formula will show whether it pays to rework old tools and supplies of this nature. It is: If the labour cost of reclaiming, plus the scrap value of the material, is greater than the cost of new tools or supplies, it does not pay.

Materials and supplies which cannot be reclaimed if sorted out can usually be sold at prices much above those which could be obtained for miscellaneous unsorted scrap.

This plan of classifying scrap yields a high return often. Take rags, for instance, which are readily salable to paper mills. Some kinds of selected rags are worth four or five times what the same rags are worth mixed with others. On one day this year, for instance, the quotation on "new shirt cuttings" was \$12'25 per hundred pounds; "blue cotton," \$8'25; while mixed rags sold for about \$3.

Waste paper is another instance. When certain grades of waste paper sell at from \$1'50 to \$6 per hundred pounds, the same papers mixed sell at 65 to 75 cents.

In the metals the same holds true. Tool steels worth several dollars a pound will bring but a few cents if mixed with other grades of steel and iron.

As a low grade of common labour suffices to sort out scrap, it is usually well worth the expense involved. Of course it is well to consult trade papers or those conversant with the trade to determine just what classification and selection of scrap should be carried out.

In nearly any plant it is worth while to study the scrap pile closely and decide which of the three methods of getting a higher price for scrap shall be used. Often, in fact usually, all three may be used successfully to yield dollars.

AGRICULTURE AND CO-OPERATION.*

BY DR. JOHN MATHAI, D.Sc.,

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THE task of rural development in this Presidency is entrusted by Government to Departments of Agriculture and Co-operation jointly. The Department of Agriculture is in charge of the supremely important duty of investigating scientifically the possibility of improving the methods, processes, instruments and raw materials of agriculture, of demonstrating the results of the investigation to agriculture and of imparting instruction in agriculture. The Department of Co-operation is entrusted with the duty of combining agriculturists into organized societies for the purpose of improving their economic condition by the joint supply of capital, raw materials and implements, by the joint preparation of their produce for the market, and by the joint marketing of the produce. The two departments are obviously complementary to each other. One is concerned mainly with investigation and technical instruction, and the other with organization.

The term 'co-operation' is apt to convey a rather narrow view of the possible scope of the co-operative department. It would be better expressed probably by the title which is in use in the United Kingdom, namely, Agricultural Organization. The word 'co-operation' as used in the manufacturing industry denotes a method of organization, distinct from the competitive, mechanical, large scale system, which is the prevailing, or, to use a rather misleading word, the natural system in that industry. The co-operative movement arose as a protest against that system. But in agriculture,

*Paper read at the Agricultural Conference, Coimbatore, on Dec. 16, 1919.

co-operation was introduced not as an alternative to a prevailing method of organization but as an alternative to no organization at all. The statement is probably not absolutely accurate, but to a large extent it represents the truth.

The point of the distinction may be re-stated thus: In the manufacturing industry co-operation stands for a different ideal of social progress from ordinary joint-stock enterprise. In co-operation the test of progress is primarily the welfare of the human factors engaged in production. In ordinary commercial enterprise, the test is rather the output, or the aggregate amount of finished produce. This, however, does not mean that in every joint-stock enterprise, the welfare of the worker is neglected or, that in every co-operative undertaking the output is necessarily smaller. But it is true in the main that, if your chief aim is to increase the output of your industry you generally start by centralising capital and control. But, if your chief aim is not to increase output but rather to increase the happiness of the community, then you try to distribute capital and management on as wide a basis as possible.

On the other hand, if you take agriculture, whether you judge progress by the test of welfare or by the test of output, in many countries co-operation is the only practicable method of organization. Of course, farming on a large scale as a joint-stock business has, in suitable cases, great advantages from the point of view of output. But except in new countries or in countries where feudalism has survived in some form or other, the possibility of organizing large farms is very little.

The difficulty is that unlike other forms of wealth land is strictly limited in quantity. If you take any given area which is already under cultivation, you cannot easily persuade the people who own the land to throw it into a common stock. This is especially true of a country which is occupied predominantly by small agricultural holders, among whom

land is the most cherished form of possession and the sense of property is most keen with regard to land. You cannot as a rule organize large joint-stock farms on the basis of single estates in a country of peasant proprietors. If people will not part with the ownership and possession of land, then you cannot get them to combine to the extent of owning and cultivating the land in common, but only to the extent of co-operation in regard to certain aspects of agriculture. This obviously sets a limit to the development of agricultural organization—a limit which is imposed by certain facts in human nature and history which, it is useless at this time of day to argue away. But within this limit there is an immense possibility of development by combination which, even in the most advanced co-operative countries, has not been explored to the fullest extent.

The necessity of co-ordinating the functions of the agricultural and co-operative departments in India is now accepted as a truism. The Committee on co-operation, over which Sir Edward Maclagan presided, made a strong point of the need for co-ordination. Their proposal was that what are called the Development Departments of Government should be placed under a single official head in order that they might function in response to a common will and policy. Whether this is a sound proposal or not, there is no doubt that the necessity of co-ordination between the various development departments to which they called attention is now generally recognised in every province. Such co-ordination has always existed informally. But in Madras the first formal step in this direction was taken in July 1917, by the holding of a joint conference between the senior officers of the two departments, a conference which, if it has not led to any substantial results capable of being measured and tabulated, has, at any rate, resulted in a perceptible awakening, on the part of agricultural co-operators, of the desire to understand and utilise the valuable discoveries of

the Agricultural Department especially in the matter of improved seed, manure and implements.

The work of the inter-departmental conference fell under two heads, (a) general lines of work, and (b) suggestions for particular areas. Under the first head, it was resolved, for example, that Deputy Directors, Assistant Directors and Assistant Registrars should endeavour to meet once in every three months at least, in order to discuss matters of mutual interest. Certain lines of activity capable of general application were recommended, such as joint rotation of crop, joint storing of seed and manure, and joint irrigation; and certain manures and food-stuffs for cattle were mentioned as being fairly safe to recommend anywhere.

The really important work of the Conference, however, was the detailed survey which it made of the directions in which co-operative societies might assist in the improvement of agriculture in definite localities in the Presidency. The suggestions necessarily covered a very wide range, but they may be briefly summarised as follow: (1) Joint purchase of seed for green manure, such as daincha, sun hemp and kolinji, (2) joint purchase of artificial manure, such as bone meal, oil-cake and fish guano, (3) joint purchase of improved seed for crops like paddy and cotton, (4) joint production in respect of sugar-cane crushing, cotton ginning and groundnut decortication, and (5) joint sale of agricultural produce, especially garden produce, such as arecanut, cocoanut and pepper on the West Coast.

The actual methods by which it was sought to secure co-ordination during the year for these various objects were mainly meetings between agricultural and co-operative officers and joint tours by them, constant correspondence on points requiring expert assistance not merely between the heads of the two departments, but between the officers in charge of local areas, and the presence of

agricultural officers at co-operative conferences.

It may be admitted at once that the success achieved by co-operative societies in carrying out the suggestions, and utilising the assistance, of the agricultural department has not been as considerable as we might wish. Those of us who have examined the quarterly reviews issued by the Registrar of Co-operative Societies during the year on the progress of agricultural co-operation will have noticed how slow, on the whole, the progress has been. But it is encouraging that in the quarter ending June last a perceptible improvement was noticed over the two previous quarters, especially in respect of the joint purchase of seeds and manures in certain areas. The movement for co-operative purchase, though still in its infancy, has run fairly strong during the past year in regard to certain articles and in certain localities, under the pressure of the general scarcity of food. If co-operative societies succeed in bringing home to their members the solid commercial value of agricultural improvement, it may be hoped that the tide of co-operative purchase which has set in may "lead us on to fortune" in the supply of agricultural requisites as well as of ordinary domestic articles.

The chief difficulties which beset co-operative societies in this matter were set out by Mr. Hemingway in a paper he read before this conference last year. Briefly the difficulties have been of three kinds: (1) Co-operative trade in agricultural requisites, which naturally bulks largest among the suggestions of the inter-departmental conference, is inherently a more difficult form of co-operation than credit. It requires a knowledge of the market, it requires more discipline and business habits, and last but not least it is often attended by serious risks, such as fluctuations in price and deterioration of quality. (2) Both the agricultural and co-operative departments have been admittedly short-handed in view of the immense possibilities which lie before them. The

whole field of non-credit co-operation lies practically unexplored in the country. The experiments in the direction which have been made in recent years have been a severe strain on the existing staff, who have had to undertake them in addition to the fairly exacting work of looking after nearly 4,000 societies in the Presidency. (3) Besides these, the special difficulties of last year—transport, supply and the season—must be remembered.

Looking towards the future, one feels there are four circumstances at least on which co-operators may base their hopes of a better day. First, the definite acceptance by Government of the necessity for expanding very considerably the staff of the co-operative department; secondly, the recognition of the valuable services of non-official co-operators by the appointment of Honorary Assistant Registrars; thirdly, the rather striking application which has been given to the principle of "trade on indent," and fourthly, the establishment of the local co-operative union as a natural self-governing unit in the co-operative system.

All these are circumstances which will obviously help co-operators in the efforts they are making to strike out new lines of work especially in the direction of agricultural improvement. The increase of staff proposed will mitigate a longstanding and acknowledged difficulty. And the habit which co-operative societies are beginning to develop of buying and occasionally selling as agents of their members affords a safe basis on which trade in agricultural requisites may be developed. It is, however, on the second and fourth points that one would lay the greatest stress, namely, the definite recognition of non-official workers and the constitution of local unions.

In any movement which depends for success on the education of public opinion, the discovery of a local unit which could form the nucleus for a spontaneous grouping of people is a step of great consequence. The

co-operative local union is still decidedly on its trial, but there is reason to believe that a group of societies situated in a small area, not bigger than a taluk and preferably much smaller within which people have easy access to one another and a fairly intimate sense of common interests, has in it the making of a good natural unit. It is through co-operative organizations based on such units that we must hope for a real permeation of our agricultural population with the idea of rural improvement, both on the scientific and on the social side. That is the importance of the local union, and it is potentially a great point in its favour.

It is not necessary to dilate on the importance of accepting the willing services of honorary workers in a movement like co-operation, and of strengthening their loyalty to the cause by giving them definite responsibilities and a definite status in the movement. If a sufficient number of workers of proved ability and experience in rural areas could be appointed as Honorary Assistant Registrars, the result will be that at the more important "Union" centres in the Presidency you would have not merely a co-operative organization capable of being used with great effect, but an individual on whom you could count for putting the organization to proper use.

Can anything be done to still further co-ordinate the work of the agricultural and co-operative department? We have made a good beginning towards co-ordination by holding a joint conference between the officers of the two departments—practice which, we hope, will be continued hereafter.

With regard to further steps, two questions might be raised for the consideration of the conference:

(1) Is it practicable and desirable to give short courses of instruction in improved methods of agriculture to honorary co-operative workers at one or more centres in the Presidency?

(2) Will it help agricultural propaganda if, in posting agricultural demonstrators, preference is given to places where co-operative unions have been formed?

ECONOMICS IN THE WEST.

The Railway Strike.

London, 15th October, 1919.—The great Railway Strike has come and gone. Happily it has left no aftermath of ill feeling. On the contrary there has not been for a long time such a friendly and moderate spirit abroad as there is to-day. The truth is that the country has realised the peril in which we stood during the recent uprising. Mr. Thomas, the railwaymen's leader has stated that we were on the verge of a revolution. That is a picturesque exaggeration. But unquestionably we were very near the point at which in most countries Civil war begins. People of all shades having looked into the abyss are not at all eager to pursue the quarrel. Even some of the extreme Labour leaders have become sweetly reasonable. Mr. Smillie, the Miner's Leader, for example, in the interview with the Prime Minister the other day over the question of nationalization was at particular pains to dissociate himself and his organization from Syndicalism, that extreme form of Continental Socialism which aims at an expropriation of owners, if necessary by compulsion, and the handing over of an industry to the workmen in whose interests it would be worked. The proceedings at the interview in themselves afford a very striking commentary on the present peaceful situation. Throughout the knotty problem of nationalisation was argued in a sober and almost friendly spirit and though Mr. Lloyd George was most uncompromising in his refusal of the demand for nationalisation the parties separated quite amicably. Beyond doubt the recent storm has cleared the air.

Out of evil good may come in this as in other cases. A direct result of the settlement of the dispute will probably be a serious attempt to secure a final adjustment of the differences between Capital and Labour.

The Government are earnestly working to this end, and when Parliament meets a varied programme will be laid before it designed to reconcile Labour. Long before this communication appears in print some of the contemplated measures will have been presented and possibly carried. Any remarks that I can make upon the subject, therefore, would be of little value. But it is permissible for me to state my belief that it is not so much in the Parliamentary programme that we must look for the final solution as in the discussions and negotiations carried on in the background. There are several highly promising plans in the field for giving Labour what it wants "a place in the sun" with stable and adequate wages. I don't know how far these will meet with favour in Labour quarters when they are examined. Hitherto Labour of all classes has looked askance at anything in the nature of co-partnership and the prejudice against any system of the kind which tends to fix a man's employment will be hard to remove. But the stream of tendency, as Mathew Arnold would have said, is towards this method of associating Capital and Labour. It is generally foreseen that if there is to be a real rapprochement it can only be based on some scheme for dividing surplus profits.

ITS LESSONS.

Apart from the moral influences of the Strike it has been of great service to the public in demonstrating some things which before were at least obscure. One of the great lessons—perhaps the greatest lesson—taught was the extreme value of Motor Transport. Of course the war brought this truth home, but the greatest achievements of the Military Transport Departments were abroad and if the public ever realised their importance the impression was only a fleeting one. In the Railway Strike the nation to the remotest hamlets was made to feel how all important this endless chain of motor lorries passing along the roads was to it, how far reaching were its activities and how

completely it was able to supply at all events the primary needs of the community in its hour of crisis. An immense fillip has consequently been given to the Motar Transport interest here and elsewhere. In all directions there are developments which ultimately will transform the system of travel and goods transport. Merchants and others who during the strike travelled long distances in some cases from places as remote from London as Liverpool and Manchester—and found the experience quite pleasant will next summer deliberately take to the road as an agreeable alternative to the iron track when time is not pressing. Manufacturers and Traders who consigned their goods by motar van where previously the railway alone was used have discovered the advantages of a door to door delivery and will organize a regular system of road transport.

There is no necessity to enlarge at any length upon the message which this phase of the strike has for India. Supposing that from some cause there was a break down of the railway system or of a part of it in your country what a fast motar transport would play in keeping the life of the community going! The splendid arterial roads, constructed many of them before the railway era, would hum with traffic; even in many of the byeways motor transport would be possible. During a great famine such as has been experienced in living memory when the railways proved inadequate for supplying the needs of the suffering population the invaluable motar lorry would save the situation. But it is not in times of emergency such as this that the best work would be accomplished. The proper place of motar lorries would be found in ordinary times to serve commonplace needs. In many cases they would take the place of light railways to the advantage of economy. But to have their full value they must have at their disposal good roads. No doubt in recent years a great deal of useful road construction has been done, but the end in view

has been mainly military rather than industrial efficiency and there is ample scope for a thoroughgoing and wide reaching system of road construction, especially in isolated districts which are not at present well served either by railways or waterways. The whole subject is of immense importance to the future prosperity of India and in the light of recent events it should be taken in hand at once.

In connection with this question of motar transport must be noticed the really startling announcement that has just appeared of the discovery of a new and inexpensive motar fuel. The statements made in the columns of the *Times* on this subject are so extraordinary as to be almost incredible. Here we are told that the fuel is produced by mixing with water a compound known only to the inventor—a South American named Andrade, of Portuguese extraction. Tests were made with the product at Nottingham on Saturday in the presence of a number of experts. "On some of the liquid being poured on to the ground it burnt steadily and emitted no smoke. The smell does not resemble that of petrol. Half a bucketful of liquid was afterwards poured into the petrol tank of Mr. Ball's car, which travelled with perfect smoothness and at a high rate of speed. More water was then added, and this seemed, if possible, to improve the running of the engine." It was stated that the car travelled thirty miles on one gallon, and that a gallon could be manufactured for five pence. Needless to say if these results or anything approaching them can really be attained on a large scale the new motor fuel will simply revolutionise the motar industry and effect a good deal besides; because obviously a motar spirit at five pence per gallon will be infinitely cheaper than either petrol or coal. But it will be well to await further and more extensive experiments before we conclude that petrol and coal are to be driven out of the market. Too often has it happened

that the fair promise of a limited experiment has not been realised at a later period.

IMPERIAL DEPARTMENT OF INDUSTRIES.

The announcement that Sir Thomas Holland is about to proceed to India to organize the new Imperial Department of Industries has been welcomed here in all quarters interested in Indian development. It is taken as an earnest of the government's resolve to give real vitality to this all important problem. As an eminent scientist and as an able administrator Sir Thomas Holland has already shown his capacity in time of War and there is little doubt that he will be equally successful in guiding India's industrial destinies in the peaceful times which we all hope lie ahead. At the end of last week Sir Thomas gave evidence before the Joint Select Committee on the India Bill. According to the *Times* his evidence was "directed to the support of the Government of India in opposition to the proposals of the Functions Committee that the development of Industries should be a transferred subject in the provincial sphere—in other words that it should be handed over, to Indian ministers responsible to the Legislative Assembly, instead of being under the charge of the Governor's Executive Council." In this matter Sir Thomas Holland will probably find himself at variance with a great mass of instructed Indian opinion, but few will question the sincerity of his views or doubt that they are supported by strong reasons. Indians certainly will not quarrel with him because he does not see eye to eye with them. They will be content with the knowledge that they are to have from his experienced aid in perhaps the greatest practical work that has ever been undertaken in their country.

A LOST OPPORTUNITY.

The sale has just been effected to an American Syndicate of the great island site in the Strand which is perhaps the finest piece of building ground available in the whole metropolis. This transaction has

recalled to me an old suggestion made in these pages that the Government of India following the example of the Dominions and of the Crown Colonies should establish a great centre in London where the commercial side of her life could be presented. In my mind's eye I had this site before me as the one most perfectly adopted for India's purposes and I pictured daily crowds of interested visitors swarming about the tastefully arranged windows gaining an invaluable lesson in the greatness and productiveness of the Indian Empire. But alas! it is not to be. This incomparable site has gone like so much else in these days to minister to the glory of the United States which does not stand in any special need of glorification at our hands. However, though this opportunity has been missed the Government of India surely will not much longer continue its attitude of splendid isolation in regard of popular commercial propaganda. There are, I am certain, enormous possibilities for good in this "shop window" form of publicity. If any one doubts it let him take his stand one day in the crowd gathered about, say the Canadian Government shop window at Charing Cross and note the remarks and attitude of the spectators.

ARNOLD WRIGHT.

The feasibility of using waste hemlock bark from paper mill operations for tanning purposes has been further demonstrated in recent tests made by the Forest Products Laboratory, Madison, Wis. The product is satisfactory to the tanner, and can be prepared at a cost that will allow it to compete with leaf bark. The use of paper mill bark for tanning would mean a source of income to the paper mill from a material which is now of little or no value.

INDUSTRIAL NOTES FROM THE UNITED STATES.

America Serving the World with Automobiles.

Washington, D. C., U. S. A., That American exports of automobiles have increased to the point where during the past year one automobile was exported from the United States on the average of every six minutes day and night, Sundays and holidays included, is shown by a detailed study of American automobile exports. The average of time elapsing between shipments of passenger cars was nine minutes, while the average time between shipments of commercial cars was thirty minutes.

These shipments mean that every minute of the day and night \$266'28 was spent by foreign purchasers of American automobiles and parts, including engines and tires. Of this amount \$48'90 was spent every minute by foreign purchasers of American tires, while \$8'93 was spent every minute on magnetos, spark plugs, etc.

In commenting on the growth of American automobile exports, it is pointed out that their total value, including both passenger cars and trucks, amounted during the fiscal year ended on June 30, 1919, to \$89,047,000, while exports of parts and tires amounted to \$30,121,000.

The total value of automobile exports for the fiscal year ended on June 30, last, was over two and one-half times that of the fiscal year 1914. In the past fiscal year there were fifteen times as many commercial cars exported as in 1913, and their value was twenty-eight times as great.

The number of passenger cars exported during the past year was 45 per cent greater than in 1914, and their value was 80 per cent greater.

The increase in exports of automobile tires is almost as significant as that of automo-

biles, since the value of these exports during the past year was over six times as great as in 1914.

Some countries spent almost as much during the past year in this country for tires as they did for automobiles. Thus in the case of Argentina, South America, for every dollar spent in the purchase of automobiles eighty-two cents was spent for tires of American make, and for every passenger and commercial car exported to Argentina approximately \$1,080 was spent on tires. Incidentally, the value of Argentina's purchases of American-made tires during the past fiscal year was eighty-three times those of 1914.

The value of United States exports of tires to Brazil in the last year was fifty-six times as great as in the year 1914. To Chile, these exports were 108 times those of 1914. Taking the whole of South America, for every dollar spent for American automobiles in the past year 70 cents was spent for tires.

The exports of tires from the United States to British India in the year ended June 30, 1919, were 131 times greater than they were for the year 1914.

A SIMPLE AND INTERESTING METHOD OF WEIGHING AIR.

Finding the weight of air is not only an interesting process, but it requires some very careful work, no matter how or with what apparatus it is attempted.

Perhaps one of the simplest ways in which the amateur can perform this work is by means of a common burnt-out incandescent lamp, with the aid of a fairly sensitive balance. The use of the bulb makes unnecessary a vacuum pump, as it is already exhausted to a high vacuum.

First, weigh the lamp accurately on the balance; then hold it under water and break off the tip by means of a pair of scissors or some other piece of metal. It will immediately fill with water, leaving only a small bubble, which represents the air which was

not exhausted from the bulb. When no more water will flow in, carefully weigh the bulb full of water, being sure to include the tip which was broken off. Now, secondly, shake the water out, and carefully dry the bulb inside and outside. This is best done by warming it. The bulb is then carefully weighed, thus giving the third result.

To find the weight of the water, subtract the third result from the second, and to find the weight of the air which would fill the same volume subtract the first result from the third. It will be understood that these last are the two results which have to be obtained very accurately, since their difference will be small. Dividing the weight of the air by the weight of the water gives the specific gravity of the air, which should come out about .0013 if the work is done accurately.

It is to be noted that an interesting and instructive question in this connection is as to whether the first result or the third is the true weight of the bulb. Many persons would say unhesitatingly that the first result represented the exact weight of the bulb, since it then contained not even air. From this, it would seem to follow that the third result would be the weight of the bulb, plus that of the air it contains. However, since the bulb can be broken into bits, after the third result has been obtained, and the weighing of the pieces will still give exactly the same result, it is very clear that the third result and not the first is the true weight of the lamp itself. The first result is, in fact, the weight of the lamp less the weight of the air which it would contain if it had not been exhausted. As will be noted, the case is similar to that of a balloon which is only partly filled with gas—the lightness of its interior buoys it up. The effect on the weight of the lamp is, of course, very small; but it is nevertheless a fact that a vacuum lamp will show, on the balance, a somewhat smaller weight than a gas-filled lamp of exactly the same size.

HOW TO TEST A USED AUTOMOBILE.

Besides the general advisability of purchasing a used car—if one buys such a car—from some person in whom the buyer has reason to place confidence, a few simple tests will be of assistance in determining the actual value of a purchase.

Automobilists recognize the fact that no part of a car is more important than the steering gear. Certain small cars have steering systems which are likely to make trouble if badly worn. This is difficult to detect on a smooth road, but will almost certainly show up if the car is driven over a rough road at about six or eight miles an hour. This kind of a test will also cause various rattles and squeaks, made by more or less loose parts, to become noticeable. A bad clutch or a worn transmission can be manipulated by the demonstrator so that a passenger will not notice any trouble. It is, therefore, advisable for the purchaser to drive the car himself and note the action of the clutch and gear shift.

The brakes should be given a good test, both by stopping the car from a fairly high speed, and by braking down a hill.

Also, if it be possible, open the drain plugs of the transmission, and rear axles, and see if any oil or thinned grease runs out. It is often the case that a bad set of gears, or gears with broken teeth, can be made noiseless for a short run by packing the case with heavy grease.

One of the easiest things to ruin on some cars is the storage battery. See that it turns the engine briskly, and that the generator charges it at a proper rate when driving at a moderate speed.

During a driving demonstration the prospective purchaser should listen carefully for loud knocks in the engine and other parts. Worn bearings can frequently be tightened to conceal somewhat the noise they would otherwise make, and certain loose parts can,

by such methods, be made to run quietly and with comparative smoothness for a time.

A prospective purchaser should, above all, avoid an "oil pumper"—that is, an engine whose pistons and rings are worn so that it pumps oil into the combustion chambers, causing most of the misfiring and bad running generally. Such an engine will run smoothly for a while, but after a long drive, if misfiring has occurred, the valves should be examined for oil leakage, which is a strong indication that the pistons and rings are worn.

Some of these tests a novice can undertake; for others he must have an experienced friend with him. The fact of the matter is that the most expert mechanic, unless he has actually seen and felt the entire mechanism of a car, cannot be sure that all parts of it are in good working condition, and this fact makes it very advisable to be extremely careful from whom the car is bought.

CROSS-BRED FRUITS AND GRAINS ARE DISEASE-PROOF.

The United States government's 500-acre experiment farm, just across the Potomac River from Washington, is one of the largest highly specialized farms in the world, and is operated by the Bureau of Plant Industry of the Department of Agriculture.

The latest thing to draw attention to this farm is the announcement, by the scientists working there, that there has been discovered, or rather produced through cross-breeding, a wilt-proof tomato. This is of great importance, because, be it known, there is a mysterious disease called "tomato wilt" which has done untold damage in regions where tomatoes are especially cultivated. The toll from this disease in one state alone last year was 50 per cent of the crop, while other states' crops were cut from 10,000 to 25,000 tons.

At the government farm, however, there was a field of tomatoes which defied every attack by the wilt. The plants in this field

were repeatedly subjected to contact with the diseased plants brought from other parts of the country for that purpose, and not one of them was affected in the slightest. From this field, therefore, was gathered a goodly supply of tomato seeds which will be sent to all the principal tomato-growing sections of the country and to other countries. The result, it is confidently predicted, will be the ultimate eradication of the disease and the consequent saving of millions of dollars to the world's tomato growers.

Sometimes the scientists at the experiment farm can find a cure for a plant disease. If they cannot, they seek a plant which will resist the disease, and then, through the mixing of varieties, evolve a seed which will produce bountifully and at the same time be immune to the disease. This was the case with the tomato experiments. Cures were sought for the tomato wilt. This involved a long and exact process, for the wilt germ had first to be isolated and then efforts made to control it by chemical sprays. As these efforts were not successful search was begun for a plant that would resist the disease. After a long time such a plant was found.

This plant, however, yielded but a single scrawny tomato, which had nothing to recommend it but a magnificent constitution. Therefore, it was decided to mate the hardy, but otherwise unprepossessing, tomato to an aristocrat of the same family from another section, noted for its prolific yield. This was done, and after several years of progressive experimenting with the progeny of this, the wilt-proof tomato has been evolved.

Another promising and rather remarkable example of cross-breeding is that of a variety of Siberian wheat with a strain from our own west. The Siberian wheat possessed the quality of superb vigor, built up through centuries of resistance to extreme cold, and the American western wheat that of abundance but the disadvantage to susceptibility to cold. Through this experiment it is expected that there will be evolved a new wheat which will combine the best qualities of both parent wheats.

While all this sounds simple enough, it is in reality a long, tedious and usually costly process. In the case of the two wheats, the expense of mating, including the succeeding tests, has amounted to nearly \$ 15,000. Of course, this price will be cheap enough if the final results are as anticipated. The progeny of the Siberian and American wheats is considered so valuable that, during the growing season, it is placed in a cage for protection from birds. This cage is of wire netting, with a head-room of eight feet, so that the cultivator can move about.

Some idea of the huge amount of work carried on at the experiment farm may be gained from the fact that there are over 1,700 different grain seeds alone being experimented with, while the variety of fruits, flowers and vegetables is almost as numerous.

UNITED STATES TO BUILD WORLD'S HIGHEST TOWER.

A monumental tower of steel, more than twice as high as the world's present highest structure, the Eiffel Tower, is to be erected by citizens of the city of Pittsburgh, Pennsylvania, as a memorial to the soldiers of that section who served in the late war.

The total height of the tower, as planned, is 2,100 feet, with an observation platform 100 feet in diameter at the 2,000-foot level, surmounted by four powerful lanterns, indicating by their colors the points of the compass to all aerial navigators within a forty-mile radius.

At the 1,500-foot, 1,000-foot and 500-foot levels, respectively, are a trophy hall, a restaurant and an amusement hall. At the base, a monolithic structure, 100 feet high and 300 feet square, contains free assembly rooms on the ground floor, and a vast convention hall 35 feet above, seating 15,000.

The concrete foundation of the tower goes down sixty feet to bedrock, and in it are embedded the base columns of the tower. The structure, which will, when completed, cost \$ 5,000,000, will require about 10,000 tons of steel, and is designed to use only the standard shapes regularly produced in the "steel city." The foundation for this gigantic monolith is now being prepared, and it is expected that the tower will be completed in 1920.

ALFRED T. MARK .

NOTES.

The *Farmer's Journal* gives the following recipe for making soap, which should be found particularly useful at the present time :—7 lb. of groundnut oil, or any fat free from salt ; 1 lb. caustic soda ; 1 bottle of cold water. The evening previous to the day on which the soap is to be made mix the soda and water in any enamel vessel which has a well-fitting lid, stirring for a few minutes, till the soda is dissolved (beware of the drops squirting up, as the mixture is burning hot and most harmful to hands and clothing). Cover up with a blanket and put into a warm safe place. Next morning warm the oil or fat in a large bucket or pot, until it is quite hot but not boiling, then remove from the fire, and pour the liquid soda or lye into the oil, very gradually and carefully stirring continually for an hour or more until the mixture looks like a stiff cake dough. Even while the mould, which may be any shallow box or tin lined with a damp cloth, is being prepared, the stirring must continue. After it is poured into the mould, smooth the surface, cover over with another damp cloth, then with a thick blanket, and leave for from 12 to 24 hours. When firmly set, turn it out, cut into bars, and return to the cloths and blankets for another eight days. It will now be ready for use and can be put out into the air to harden. The preparation of the soda over-night, the thorough mixing of lye and oil, the conserving of the heat to prevent rapid hardening all combine to make a better and softer soap than would otherwise be the case. If, as occasionally happens, the mixture will not thicken while it is being stirred, put it on the fire and boil for a little while, stirring all the time ; then take it off and continue stirring till it has cooled off somewhat. If, on the other hand, it thickens too rapidly and looks crumbly in appearance, put it on

the fire, add a dash of boiling water, and just bring to the boil; stir well, then pour into the mould. The stirring should be done with a stout stick or bamboo.

The Imperial Economic Botanists at Pusa in their report for 1918-19, state:—The work in progress at Quetta on the sun-drying of vegetables has been extended considerably. Towards the end of last year (1918) this product was placed on the market for the first time at Quetta and also at Calcutta. About 1,500 half-pound tins were prepared which found a ready sale. The demand at Quetta was extraordinary. The orders amounted to about 20,000 tins of which only about five per cent could be met. The principal purchasers were the engineering parties engaged on the Nushki Extension Railway and the various regiments operating in Mesopotamia and Persia. An exhibit of Quetta sun-dried vegetables was arranged at the Medical Conversazione at Parel held in connection with the Bombay meeting of the Indian Science Congress. As usual, this attracted the attention of a large number of visitors. It also led to the establishment of an agency in Bombay for the sale of the product. The exhibit was afterwards shown at the Lucknow Flower Show. During the present year (1919), the production of sun-dried vegetables at Quetta has been increased and seven selling agencies in India, in addition to the one at Quetta, have been stocked. The cost of production has been considerably reduced and the work accelerated by the use of power peeling and slicing machines imported from England. These have proved very successful and easy to operate. The preliminary results obtained on the anti-scorbutic and anti-beri beri properties of sun-dried vegetables were communicated by Captain Shorten, I.M.S., Professor of Physiology, Medical College, Calcutta, to the Medical Section of the Indian Science Congress at Bombay. This aspect of the work has since been considerably developed,

and it is expected that the experiments will be completed during the present year.

The Bombay Government reviewing the work of the Registrar of the Co-operative Societies for the official year 1918, point out that failure of the monsoon of 1918 severely tried the resisting capacity of the agriculturists who form the bulk of the members of the co-operative societies. Working of these societies show that agricultural co-operation has achieved a high degree of protection against the vicissitudes of the season and lend further support to the views of the Government formed as a result of the famine relief operation that the people of the Bombay presidency have developed the staying power of the unexpected strength which was evidenced in the loyalty of the depositors to their societies indicated by the comparatively small amount of the withdrawal. In Bombay there is one agricultural society for 12,293 of the population and the average membership is 71 per society, while Madras and the Punjab have only 59 and 22 respectively. Average capital per society is also greatest in Bombay. Amongst the millhands of Bombay good work is being done mainly through the agency of the Debit Redemption Committee and the Social Service League. The resolution concludes paying a tribute to the numerous honorary organizers who helped in the formation of the societies and Mr. Eubank, the Registrar who has devoted himself to the work with enthusiasm and energy for the past eight years.

Presiding for the last time over the annual meeting of the Board of Agriculture, Sir Claude Hill in the course of a lengthy speech said: One thing was certain that the system under which agriculture had been administered, controlled and stimulated would be radically altered. Agriculture would not only be a provincial subject but would be administered by a Minister. Most of the

major provinces in India would shortly be furnished with well-equipped colleges for higher education and for research in Agriculture. Regarding recruitment, the policy for the future would be to Indianize the Imperial Agriculture service as rapidly as possible having due regard of the maintenance of the high standard of efficiency. Referring to Reforms, Sir Claude said whether it be in the Proclamation of 1858 or in the Proclamation of 20th August, 1917, the goal described was not an accidental and irresponsible utterance resulting from political expediency. It was a pronouncement crystallized in words of developed consciousness of a stage reached in the attainment of the ideal of our race.

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A bulletin issued by the Institute of Science and Industry (Commonwealth of Australia) deals with one of the greatest obstacles to pastoral and agricultural progress in a large portion of the Commonwealth. An area of over 20,000,000 acres is infested with prickly pear in Queensland, and an area of over 2,200,000 acres in New South Wales. The rate of increase of the pest is estimated at 1,000,000 acres per annum. No discrimination is shown in the land attacked. Rich country is as quickly overcome as poor country, and in a short time is rendered unproductive and valueless. The plant is extremely difficult to eradicate, and no satisfactory machine for destroying it has yet been invented. The manufacture from it of alcohol, paper or cardboard, potash, and various other materials has been suggested, but the fact that prickly pear contains a very large percentage of water makes its profitable commercial utilization very unlikely.

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The death is reported of the well-known paddy expert, Baroda Kanta Brahmacharee, late zemindar of Barodi (Dacca) and recently of Margohi (Dehri-on-Sone) where he established a paddy research farm. He renounced his family and zemindary and spent the last fifteen years of his life in agricultural pursuits. He created a sensation at Comilla by demonstrating that the present poor yield paddy viz., ten maunds per bigha, is due to degeneration of the seed and that by Hailey's system of selection the yield could be four-fold. He died on the field of his life-long labour amidst peasants for whose benefit he devoted his declining years.

GLEANINGS.

Mr. (late Sir Titus) Salt, who had been for some years connected with woollen manufacture, happened one day in 1836 to notice at Liverpool some three or four hundred sacks of alpaca wool that had been imported from time to time from South America in the hope of finding a manufacturer who might buy them for some purpose. Several men had tried to work up this new material, but without success, so there it lay for years, no one seeming to want it, till Mr. Salt came across it, and, after a number of trials, in which he modified his wool machinery to suit it; adapting it afresh and overcoming many obstacles he finally solved the problem, by adopting cotton warps, and soon after put on the market a new material, alpaca, a soft, glossy, elegant fabric, which so took the fancy of the public that in the course of fifteen years Mr. Salt amassed an enormous fortune which enabled him to carry on the great philanthropical work which made him famous says the *Canadian Textile Journal*.

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Mr. Calvert, the Registrar of Co-operative Societies in the Punjab, says that the following five causes have operated to bring about the indebtedness of the Punjab Peasantry:—(1) The sudden enhancement of credit due to new conditions introduced by the British Government, (2) the abuse of this credit by clever usurers who encouraged borrowing in order to secure control of produce, (3) the famines of 1861, 1869, etc., and heavy mortality amongst cattle which drove the cultivators to borrow and so involved them in the money-lender's clutches, (4) the rigidity of land revenue collection accentuated by the tactics of the usurer who seized the whole produce and so compelled the cultivator to borrow afresh for the state demand, and (5) a system of civil law which

was unsuitable inasmuch as it favoured the clever money-lender against the ignorant peasant.

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A French patent proposes to dye wool and silk black by using, at boil, a bath containing lampblack, burnt sienna, extract of chestnut and acetate of iron. This, at first sight, seems an impracticable combination, writes *Textile World Journal*, since lampblack and sienna are insoluble bodies and so have no penetrative power on either silk or wool. Chestnut extract and the iron compound would yield a blue black. Used in the same bath, however, the colour would be loose and fugitive. Something else not mentioned in the patent may possibly bring about a union of these inharmonious bodies. This, by the way, was a German trick to patent everything except the key to the process.

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In the two cities of Nove Scotia, Halifax and Sydney, shade trees are only permitted to be cut down or trimmed with the consent of and under the supervision of the civil authorities. In the towns and Municipalities of the Province the statute forbids any persons or corporation to cut or mutilate trees upon the highway without his obtaining the consent in writing of the municipality or mayor of the town, and provides a penalty for cutting down or trimming the trees without such consent.

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According to British Patent 126,754, a soluble indigotin dye is prepared by dissolving indigo in sulphuric acid, allowing the mixture to stand for twenty-four hours, adding alum or cream of tartar, if necessary, and heating the mass until fluxed, cooling and neutralising with an alkali. The dye can be mixed with a soluble cudbear extract dye.

There is an interesting article in the April for (1919) number of the *Bulletin of the Imperial Institute* on investigations of some materials suggested for the manufacture of paper supplied from South Africa, Rhodesia, Egypt, Papua and St. Helena. The materials include several kinds of grass and some barks and woods.

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The total annual output of the Canadian Pulp and Paper industry exceeds in value \$ 85,000,000. It gives employment to 25,000 individuals. Its annual payroll exceeds \$ 15,000,000. It has sent more than 3,000 men to the war.

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The silk factories of the United States are now turning out products valued at approximately \$ 500,000,000 a year, against \$ 100,000,000 in 1900, and \$ 250,000,000 a year at the beginning of the war.

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The newspapers of the United States consume 2,000,000 tons of newsprint every year, of which Canada supplies, approximately one-fourth.

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Great confidence in the future of coconut planting appears to exist, in Trinidad, and coconut planting is being carried by sugar and cocoa planters.

SPEECHES AND PRONOUNCEMENTS.

PATNA UNIVERSITY CONVOCATION

Sir R. N. Mookerjee's Address.

The following is the full text of the address delivered by Sir Rajendra Nath Mookerjee at the annual Convocation of the University of Patna, on the 29th November, 1919, in the presence of His Honour the Lieutenant Governor:—

Your Honour, Mr. Vice Chancellor, Ladies and Gentlemen,—I esteem very highly the privilege and honour which has been conferred upon me by your Chancellor in asking me to deliver the Convocation Address to the Patna University. At the same time I felt considerable diffidence in accepting His Honour's invitation. I have no particular qualification for the part which he has asked me to play in addressing a University Convocation and I feel that I can only have been asked to stand here to-day, not for what he expects me to say but for what I represent. And the only value which attaches to my words must arise from my experience and connection with commerce and industry.

I should like to preface my remarks by offering my hearty congratulations to the recipients of prizes and diplomas and I would beg them to remember that their education does not end with their University career, where they but lay the foundation; the real work of superstructure beginning when their faculties mature with observation and experience of life. I would also impress upon them never to part with the best gift they have received from their University: the inspiration of high ideals.

Gentlemen, the present is essentially a time of reconstruction and reform. The searching test of war brought to light many weaknesses in our political and social system, many gaps in our moral and mental equipment—many defects in our industrial organization, and we are now all considering anxiously how best we can turn to advantage the lessons which we have learnt at such terrible sacrifices. It would be altogether beyond the scope of a Convocation address to deal here with the vast problems of reform which now confront the statesmen of nearly every civilised country in the world. But there is one consideration which I propose to place before you in this connection because in my opinion it lies at the root of the whole problem of reform

and because I think it is a matter in which this University and other Universities are called upon to play an enormously important part—it is this, that the aim of your University should be to supply young men with an education which will fit them to enter any vocation in life and enable them to occupy their proper place in commerce and industry, which will provide unlimited opportunities in this province for all for generations to come. Old Universities in Europe have always had close relations with the development of industries. Even as long back as the eighteenth century, Universities materially helped the cause of industries. It was in the University workshop of Glasgow that James Watt evolved the idea of a separate condenser. History tells us that many successful men of business owed their success to the inspiration they received from their professors while at college.

We should no longer be content to give our sons University education which is suitable only for the well-to-do and leisured classes which possess some fixed income. There is only a very limited field for purely literary men and lawyers and only a small fraction of these can attain success. It is essential that those who enter the legal profession should have means to support themselves for the first few years of their career in order to enable them to wait patiently for success. The inadequate development of Indian industry is, in my judgment, attributable to our system of education. But times are fast changing; the world war has created new ideas and has opened up splendid opportunities, which, if not taken advantage of, will pass by. Here in India signs are clearly visible that the war has given a fresh and vigorous impetus to the development of our industries and has overcome the shyness of, Indian capital. It is incumbent on us, therefore, to educate our young men in the direction in which the whole civilised world is moving. We must enlarge our system of education, and although it has undoubtedly done great good to the country in the past, yet we can not afford to disregard what other civilised nations are doing. I am sure your University authorities will agree with me that the primary duty of modern University is to prepare its graduates to be successful and contented citizens. The war has brought into conspicuous notice the absolute necessity of really efficient and practical education in our Universities in order to produce a good supply of able scientists, engineers, chemists, organizers and administrators to enable us to take our place alongside the great commercial and industrial nations. The rapid progress of scientific discovery in Europe during the war has led to an enormous increase in the application of science in the development of industries and has given a great impetus to the

establishment of scientific research institutes. It is hardly necessary to point out that the great industrial progress of Europe in pre-war days, and especially of the United States and Germany is due to the facilities the Universities of those countries afforded to the people to acquire scientific and technical knowledge. The United States and Germany owed the vast increase in their wealth and rapid industrial expansion to the development of science and scientific research in its practical aspect. Research Institutes with up-to-date laboratories for applied science will cost a considerable sum of money and it will be difficult for the Government of the Province, with its limited resources, to supply the necessary funds within a reasonable time. Private endowment should come to the rescue. Fortunately for your Province you have some enormously wealthy landlords, many of whom could easily afford to endow such institutions with sufficient funds following the illustrious and noble examples of Sir Tark Nath Palit and Sir Rash Behari Ghosh of Bengal and the Great Tatas of Bombay. It is also essential that there should be close co-operation between the University and the great industrial and commercial concerns of the Province, representatives of which should have a voice in the management of the University.

India has led, hitherto, a sheltered political life and if she is to come into her own, she must not be fit to hold her own. She must not be content, as heretofore, merely with eyes to see and brain to reflect on what she sees. She must have feet to march on the path of progress and hands to grasp her opportunities. We need never fear that India will be deficient in culture or in perception, so long as she remembers the history of her own intellectual development, and relies for such studies on her own ancient and glorious literature. I do not ignore but, on the contrary, I give full value to the literary aspect of University life, tradition and training. But the message I have come here to-day to give you, in such imperfect language as I am able to command is that the economic advancement of the people thought out the world will not allow any nation in the future to rest content with making a minimum use of the natural advantages of the country which it inhabits. If that country is not developed by its own children then strangers will inevitably take from them the business and profit of so doing. Equip yourselves therefore for the task of enabling your country to hold its own in this world competition. The country which possesses natural resources and which has scientific specialists to exploit them is bound to have a great advantage over other nations. India possesses natural resources in abundance and Indian Universities should be given necessary equipment to enable them to produce able

scientists. The report of the Industrial Commission has indicated the class of men needed and the way in which they can be produced and has, in respect of such matters as Institutions of higher technical training and research, made proposals which the Calcutta University Commission have cordially accepted. I need not go into details here. What I should like to impress upon the governors of the University of Patna is that they have a unique opportunity of assisting in the industrial development of this country by making a special feature of commercial and industrial classes for the purpose of training men qualified to make up an industrial or commercial career on leaving the University.

Your Province is rich in mineral deposits. Coal is by far the most important mineral product, for coal is the main stay of industrial prosperity, and Bihar owns more than half of what the whole of India possesses. Next to coal is iron ore and in your Province lie very extensive deposits the quality of which is not inferior to any found in other parts of the world. The great success of the manufacture of steel organized by the great house of Tata is due to the fact that both good coal and good iron are found in close vicinity to the Works. These two products are of much greater consequence than all other mineral products put together. The existence of extensive coal and iron fields in your Province gives you a much better chance for the development of important industries than any other province in India. The greatest commercial nations of the world to-day are those which have extensive coal and iron deposits. You have so far failed to make use of the natural resources of your Province. Your present system of University education does not enable you to visualise the vast importance and possibilities of the industrial opportunities you possess, or to appreciate the value of the mineral wealth that lies at your feet in this Province. Modern science has succeeded in extracting from coal some of the most precious and some of the most necessary commodities, such as tar, pitch, benzene, naphthalene, creosote, dyes sulphate of ammonia, disinfectants and explosives, as well as some of the valuable drugs, such as saccharin, aspirin and many others. There is no reason why within a few years of the establishment of scientific and technological departments of your University some of its passed chemical students should not achieve profitable employment in undertakings which I confidently expect will at no distant date be set on foot to deal with your coal bye-products.

I think I have said enough in trying to convince you and the educational authorities that to keep pace with other parts of the world and to open new fields for the career of our graduates, Government

and your wealthy landlords should join hands and do their utmost to equip your new University with technological and industrial departments, and the undergraduate should seize without loss of time the opportunities which I hope, will soon be given to them by their University.

But I fear that I am importing too much of my own business predispositions into the midst of these cultured surroundings. I am conscious of the fact that in building up certain traits of character nothing can take the place of a University, and, although I attach much importance to the scientific and commercial side of education, still I hold that a University should not be content with this only, disregarding its higher functions. The ideal of a University education is to foster the spirit of discipline, obedience, self-control and humility, to refine the manners and to enrich the intellect, and to impart a high standard of culture and judgment. Above all a graduate should leave his University with the hallmark of gentleman not in the ordinary sense of the world as we generally understand it in our country, but in its highest significance. The best result of a University education in England is manifested in the graduate who is always a gentleman. Good cloths, fine speech and good manners alone do not make a gentleman. A gentleman is he who has a strong character, whose truth is constant and who is honest in his acts, veracious in his speech and one who wins the confidence of all by living a life of perfect integrity. He who lacks in any one of these qualifications that I have stated is unworthy of the distinction and high honour of the University degree which has been bestowed on him.

University education stamps on its alumni a character which is a possession of lifelong value. It is only the harmonious development of all faculties, intellectual, moral and physical, which is cultivated and practised in the University life of the students, that constitutes a perfect University man and this development can be attained by a comprehensive scheme of residential arrangements under careful supervision which will enable its students to come in closer contact with one another than has hitherto been possible to develop that *esprit de corps* which is the foundation of all corporate lives and the source of good and wholesome traditions. The provision of spacious playing fields will promote healthy recreation without which the mind becomes stagnant and character tends to drop.

But let me return once more to the subject which I have most at heart, the need for industrial development.

If the graduates of a University desire to take their places in the world of industry and commerce they must prove their qualifications not only in

literary, scientific and technical efficiency but in their strength of character, showing self-reliance, initiative, sense of duty, strong common sense and readiness to assume responsibility.

I hesitate to tread, even for a moment, upon the thorny ground of politics, but on the very eve of the introduction of the Reform Scheme it is difficult to refrain from saying a few words to University graduates and undergraduates on whom the success of future self-government will depend. With the advent of responsible Government, demands will be made upon the moral qualities which hitherto have not been made. The political leaders of the future will be called upon more and more to exercise such qualities as self control, patience, tolerance of the views of those who differ from them, sympathetic understanding of aspirations and ideas which they may not in their own hearts approve. The electors will be called upon to exercise a wise restraint in their use of the vote; they will have to cultivate that quality which is half intellectual and half moral judgment. It will be to the Universities, in the first place at any rate, that we shall have to look for the inculcation of these qualities: for it is from the Universities that our political leaders and electors will at first come. I do not agree with those who are of opinion that our post-graduate students should rigidly avoid politics. The political field is the rightful inheritance of the well-educated man. To tell graduates that they are to refrain from all political controversy is in my opinion to create the inevitable desire for forbidden fruit. It seems to my mind far better, in the interest of good government, that the young men in our Universities should study politics and learn to understand properly the politics of the world and particularly of their country, in a properly organized Graduate's Political Society under the supervision of a responsible professor, so that when they leave their University they will be able to direct and confine their political opinions to their proper channels with beneficial results. It requires years of deep study to enable one to form a judgment of and to arrive at the right conclusion in any political problem. Nowhere is superficial knowledge more dangerous than in politics. There can be no objection, I think, to graduates attending political meetings within reasonable limits if their object be to educate themselves in politics and to learn its difficult problems, accustoming themselves to discount at its true value the violent language which in most countries accompanies a political movement. Their education should enable them to carefully weigh all the arguments and to arrive at a conclusion dictated by their own judgment and common sense. They will then be able to adduce intelligent reasons for the opinions they hold and to add weight to the

uninstructed political opinions of the public. I would remind those who wish to follow in the footsteps of men like the late Mr. Gokhale that it is necessary to spend years in studying the knotty problems of politics and to learn to sacrifice personal and private interests to the public good, before it is possible to become a political leader of the country in the true sense of the word.

Gentlemen, I am afraid, I have exhausted your patience and have also disappointed you. I am conscious that my address is full of imperfections and is desultory and discursive, and at times dogmatic. But I also know that you are kindly disposed and indulgent—all University men are indulgent—especially to one, who has not the habit and practice of delivering addresses to such a learned assembly on a subject on which he is profoundly ignorant. I shall feel that I have not wasted your time if I have been able to impress upon the graduates and undergraduates of the University, the necessity for practical technological and scientific education and that henceforth the application of science to industry should be a powerful factor and an established fact and not merely a pious wish.

India is at the parting of the ways; we Indians are throwing off the swaddling clothes which have wrapped us round so long. We are on the eve of momentous changes in the political, social and industrial world. With our feet planted on the ladder of self-Government, admitted as a member of the League of Nations, we can look forward to a bright political future as a sister nation in the British Commonwealth of Nations. We are beginning to throw off restraints and prejudices of caste which have clogged the wheels of progress for years without numbers. We have come to see the importance of developing, to the utmost of our capacity, the illimitable resources in metals and minerals which have lain hidden for so long in the bowels of the earth and we are beginning to recognise the paramount need of providing such a system of education and training as will enable our young men to take the fullest advantage of this enormous potential wealth. The prospect is bright; the omens are auspicious. A unique opportunity lies before the Patna University to play an important part in shaping India's destiny. May she not fail to rise to the height of this great occasion.

CONTROL OF FOODSTUFFS IN INDIA.

The following Resolution of the Government of India in the Department of Revenue and Agriculture (Foodstuffs) on the report on the operations of the Indian Foodstuffs Commissioner, is published in the *Supplement to the Gazette of India*, dated the 29th November, 1919 :—

In the debate on the resolution moved by the Hon'ble Mr. Chanda, in the Legislative Council on the 15th September last, on the subject of high prices, the Hon'ble Mr. Mant promised that the report of the Indian Foodstuffs Commissioner would be published as soon as possible. The report has now been received and is published¹ for general information.

The Government of India do not think it necessary to comment at length on the report. It deals fully with the various factors which conspired to bring about a grave situation at the end of 1918, and with the measures taken to meet that situation. Some of these measures were very unusual. As pointed out in the report, the Government of India up to the date of the outbreak of the war had always refused to adopt a policy of restricting the export of foodgrains from India. The abnormal circumstances created by the war compelled them, in common with the Governments of almost all countries in the civilised world, to resort to an expedient which in ordinary times is open to strong objections. Although the extraordinarily high level of prices still prevailing in India makes it impossible for them at present to remove the embargo on export, they are fully alive to the necessity of allowing, as soon as circumstances permit, the export trade in foodgrains to resume its normal course. A beginning has been made in this direction. It has already been found possible to withdraw either wholly or partially the notifications prohibiting the export of certain foodstuffs, such as ragi, onions, potatoes and chillies. The Government of India have already announced their intension regarding exports of wheat, gram, jowar, bajra and various other kinds of grain and pulse, and they hope shortly to be able to make a statement on the subject of their rice policy in 1920.

Probably no part of the Government of India's policy during the past year has aroused more criticism than the control exercised over the movements

¹ The text of the Report is published in the *Supplement to the Gazette of India*, dated the 29th November, 1919.

by rail of foodgrains within India. As the report shows, the system of railway priority certificates had its origin in the inability of the railways to perform their normal function of distribution. When the system was first introduced, a large measure of control was deliberately placed in the hands of Local Governments with a view to decentralisation, but it was soon found necessary to exercise central control over inter-provincial movements in order to economise the aggregate food-supplies of the country. The choice lay between two alternative policies. One course would have been to allow no restrictions on the movement between one province and another of foodgrains for which certificates had been issued by Directors of Civil Supplies. This course was considered at the end of 1918 and was rejected. At that time it was feared that India would be in serious straits for food in the middle of 1919, and the danger was, that the available supplies in surplus provinces would be rapidly exhausted by inconsiderate demands from deficit areas. It was decided, therefore, that the wiser plan was to conserve the supplies of wheat, gram and rice in India by regulating export from surplus provinces, and the primary object of appointing the Indian Foodstuffs Commissioner was that he might co-ordinate demands from the different provinces and make an equitable distribution of such supplies as were known to be available. The Government of India were constrained on more than one occasion to override the wishes of particular Governments, but they believe that this report, especially paragraph 53, will show that in all the circumstances of the year the course which they adopted was justified by the interests of India as a whole.

The other important measures taken consisted of the arrangements made for the control, in the interests of India, of the Burma rice trade, and for the importation of Australian wheat. Both these measures were, on the whole, thoroughly successful, and there can be no question as to the advantages derived by India from Mr. Gubbay's ingenious system of controlling not only the distribution of exports of Burma rice, but also the prices at which that rice was sold. The Government of India desire to express their acknowledgments of his valuable services and also of those of Mr. Innes, who successfully carried the scheme through, and whose unfailing tact and resource surmounted innumerable difficulties. The Government of India are pleased to endorse Mr. Innes' commendations of the other officers referred to in the report, and they would be glad if local Governments would suitably acknowledge the services of Provincial Directors of Civil Supplies, whose co-operation with the Food-stuffs Commissioner has enabled the country to get through a most critical period.

ALL-INDIA SCIENTIFIC SERVICES.

A Resolution of the Government of India, Indian Munitions Board (No. M.-440, dated the 26th November, 1919), on the proposal for the creation of an All-India Scientific Services, says :—

The Indian Industrial Commission, in paragraphs 116,118 of their Report, have pointed out that the present arrangements for the recruiting, employment and grouping of scientific officers for the purpose of carrying out research work are unsatisfactory. There have not been wanting, it is true, individual officers who have done valuable work in their own special lines. But some of those who have achieved the greatest degree of success, are also most insistent in their cry for co-ordination, and for the help of other scientists in dealing with the complicated problems that demand solution. The Industrial Commission draw attention, not only to the absence of an effective means for meeting this demand, but also to the entire absence of a scientific atmosphere, except in a few isolated centres. The lack of scientific intercourse and of prospects of material advancement tends to deprive workers of any incentive to research. Unsatisfactory as the existing position is from the point of view of the employed, it is even less satisfactory from that of the employer. The inability of local Governments to judge of the work of the isolated scientific officers whom they employ, or to replace them when they leave or fall ill, has been fully emphasised by the Industrial Commission. The small, but not unimportant, results achieved with the help of the Indian Munitions Board, as an agency for marshalling the scientific forces of the country to attack a few problems of considerable local importance under war conditions, throw into strong contrast the vast field of possibilities from which a consistent policy pursued before the war, might have developed valuable economic assets in peace time and powerful safeguards of established industries in time of war. There have, however, not been wanting examples of attempts, more or less successful, to build up organizations of officers for scientific work ; instances such as the Geological Survey of India and the Indian Agricultural Service, prove by their success, even on their present limited scale, the advantages of system, even though that system differs radically in the case of these two departments. The importance of organizing scientific workers, not only in the interest of the workers themselves, but of the work which they perform and

of the public in whose interest they perform it, is now widely recognised; and the question for consideration appears to the Government of India to be the form of organization best suited for Indian conditions, political, economic and geographical. A scheme for all India services as a basis of scientific organization has been put forward by the Indian Industrial Commission in paragraphs 120-126 of their Report, and supported by the Government of India, subject to certain criticisms of details, in their despatch * No. 15 (Industries), dated the 4th June, 1919. The Government of India have decided to deal, in the first place, with the case of officers employed under Government as chemists; and have, with the concurrence of the Secretary of State, appointed a Committee, with the following terms of reference:—(1) To consider whether an all-India Chemical Service is the best and most suitable method of overcoming the difficulties and deficiencies pointed out by the Indian Industrial Commission. (2) In the event of the Committee approving the principle of an all-India Service, to devise terms of recruitment, employment and organization; to indicate the extent to which chemists already in Government employ should be included in that service; and to suggest what should be the relations of the proposed organization with the public and with departments of the Government of India and of local Governments. (3) In particular, to frame proposals for the location, scope and organization of institutions for chemical research. Professor J. F. Thorpe, C.B.E., D.Sc., Ph.D., F.I.C., F.R.S., Professor of Organic Chemistry in the Imperial College of Science and Technology, London, has been appointed President, and Dr. J. L. Simonsen, F.I.C., F.A.S.B., Forest Chemist, Dehra Dun, has been appointed Member and Secretary. The constitution of the Committee will be announced shortly.

Paragraphs 22 to 30 of the despatch are published in the *Supplement to the Gazette of India* of the 29th November, 1919.

TOPICS FROM ECONOMIC PERIODICALS.

SUGAR PRODUCTION IN INDIA.

Facts and Fancies.

Dr. C. A. Barber, C.I.E., Sugar-cane Expert to the Government of India, writes to the *Times* (Trade Supplement):—

The character of the Indian sugar industry is peculiar and complicated by many special features, and there appears to be a great deal of misconception in this country as to its possibilities and limitations.

It must be noted, at the outset, that the varieties grown are so different from those in the tropics that they practically form a different species of plant, and the produce obtained from the fields is neither sugar nor a substance from which, as raw material, sugar can be economically manufactured. It has become the custom in recent years, presumably from a desire for completeness of survey, to include the Indian indigenous industry in the world's totals of sugar production and export, and this has not infrequently led to invidious comparisons between the sugar methods of the British Empire and those of other countries, whether in the exploitation of the sugar-cane or beet-root. The huge endemic cane-growing of the natives of China, Central Africa, South America, and the Pacific Islands are not added, presumably for lack of details, but the Indian figures, as will be shown later, have as little to do with the world's markets as have those of the Celestial Empire. Thanks to the magnificent work of the Indian revenue officials, figures of crop acreages and yields are available in almost superabundant detail, and these, coupled with a skilful handling by the Director of Statistics, have been eagerly-seized upon by the trade journals, without discrimination as to their relevance.

USELESS FIGURES.

It is the claim of the writer that, with the exception of the small quantity of sugar produced in Indian factories and the large quantity imported into the country, the Indian figures should be dropped, at any rate until such time as similar figures are available for the inclusion of the crude production of other countries. To the ordinary reader it certainly seems anomalous that India, with an acreage under "sugar-cane" greater than all the rest of the countries under report, should yet find it necessary to import many hundreds of thousands of tons of sugar from Mauritius or Java every year to supply its

needs; and the fact that India does not produce sugar would come as a surprise to such a reader. And when such a usually well-informed writer as the editor of *Tropical Life* points to India as the obvious source from which increased quantities of Empire grown sugar can be expected, if only rational methods are adopted, in that it should be a comparatively easy matter for that country to double its yield per acre, it is time that an authoritative account should be given of the possibilities of the case. It is a fact worthy of consideration that, while such ideas seem to prevail among the bulk of English writers on the subject, every worker in India takes a different view, and regards the possibility of India ever becoming a sugar-exporting country as extremely doubtful.

The Indian Government, never a very efficient publicist, is fully alive to the necessity of improving the local industry, and has paid great attention to it during recent years. Among the latest steps taken have been the formation of a permanent "Sugar-Bureau," whose first duty is to collect into one office, arrange, and sift the enormous mass of information which has accumulated as the result of the work of specialists during the past thirty or forty years, and the appointment of a strong committee, under the chairmanship of Mr. Jas. Mackenna, the Agricultural Adviser to the Government of India, which will assemble in October.

The accompanying map gives a birds'-eye view of the relative proportions in which sugar-cane is grown in the various Provinces (not published in this *Journal*. Ed., M. E. J.) A convention has been introduced by which each on the map represents 10,000 acres under cane. The decimal figures give the proportional yield of gur, as compared with the average production for the whole of India, namely, 2,719lb. per acre. The figures, both for acreage and yield, being averages for a series of years ending with 1918, have been extracted from the latest reports of the Director of Statistics, and may be taken as substantially correct. The main sugar tract of India, it is at once seen, is confined to a broad strip of country along the southern margin of the Himalayan Mountains, and comprises the United Provinces and parts of the Punjab, Bihar, and Bengal. The area under sugar-cane in this tract, most of it well outside the tropics, averaged during the last five years 2,197,380 acres, while tropical India had only 292,520 acres under cane.

SPECIAL TYPES OF CANES.

It has been found, after many years of experiment, that, while excellent sugar-canes of the same type as those grown in the West Indies, Mauritius, and Java can be grown in Madras and Bombay, and, to

a less degree, in Bengal, Assam, and Burma, they cannot be got to a millable condition in the United Provinces and the Punjab. In these latter provinces, in Bihar and most of Bengal, their place is taken by altogether different types of canes, growing nowhere else in the world (excepting one form in Natal), so different from the sugar-cane of the tropics that one is tempted to regard them as the descendants of an altogether different wild parent. These sugar-canes, which occur in the greatest variety (130 have been collected thus far at the Coimbatore Cane-Breeding Station), are indigenous in India, that is originated there, while it is probable that the true sugar-cane arose from a different ancestor in Malaya or the Pacific Islands. The Indian canes are much smaller in every way, frequently hardly thicker than a stylographic pen; they have a hard rind, much fibre, and little juice; they tiller enormously, 50 canes often arising from one rootstock, are very hardy and, to a certain extent, frost resistant. They cannot stand generous cultivation, and a comparatively light addition of manure hinders the formation of sugar in the tissues. Under the most favourable conditions they do not usually produce a couple of tons of gur per acre, and often (in the Punjab, for instance) they do not produce much more than a quarter of this quantity. They have, however, this in their favour, that they are the only class of cane which can mature at all in the peculiar climatic conditions of the tract, and they appear to be excellently adapted to these conditions.

A very cursory knowledge of the climate of North India would convince any sugar-cane planter of the impossibility of growing thick, tropical canes for factory purposes. During the "cold whether" (November to March) there is little rain, and the temperature is very low, with occasional frosts. The cane sets are planted towards the end of this period, and take a month or even six weeks to germinate and appear above ground. The young shoots are met by the "hot whether." During April, May, and June the temperature rises steadily, until it far exceeds that in Bombay and Madras and the tropics generally. The air is excessively dry, and the canes, in spite of irrigation, lead a struggling existence. With the arrival of the monsoon, all is changed. During "the rains" large tracts of country become soaked with moisture, if not water-logged, while the temperature, although falling considerably, remains high. It has been said that the sugar-cane thrives best where the white man cannot live, and that accurately describes the state of the atmosphere. If drainage is efficient, the conditions are ideal for rapid plant growth, and the young cane plants readily respond and shoot up with amazing vigour. But these ideal conditions do not last long. The

rains gradually lessen, and towards the end of October the temperature has fallen so low that growth practically ceases and the cold weather sets in. The total period of the growth of the cane above ground may be taken as about six months, and in only four of these are the conditions at all suitable for thick canes. What variety from the tropics would have a chance of maturing in these circumstances?

INDIA'S LIMITATIONS.

This bare statement of facts will, it is thought, bear out the contention that the "sugar industry" of India is peculiar and complicated by many special features, and the comparatively low yield of slightly over a ton of sugar to the acre should not be thrown in the face of the Empire sugar-makers. To alter the practice of centuries is no easy matter. It is, furthermore, the settled policy of the British Government to allow the utmost freedom to subject races, as regards local customs, which is compatible with good government. We cannot for a moment consider the introduction, whether in India or Nigeria, of such measures as the Japanese have used to build up the sugar industry of Formosa, or even the modified State control which has been adopted by the Dutch in Java. What, then, is Government doing to improve the sugar industry in India? This is a large question, and its full answer would traverse the steady work of many officials during the past quarter of a century, if not much longer. Briefly, the chief lines of study are (1) the improvement of the class of canes; (2) the introduction of more careful treatment of the canes in the fields; (3) the improvement of the methods of manufacture. Much progress has been made in the past in all these directions, and there is no sign or the efforts of the agricultural officers slackening—rather the reverse. The introduction of sugar factories is quite another matter, but it also is receiving very special attention, for there are, especially in Assam, Bombay, and Burma, still large tracts of country which are unoccupied, and which have been proved to be capable of giving good crops of factory canes. But each of these areas has its special difficulties—labour, transport, water, malaria, land rights, capital, etc.—and cannot be dealt with briefly. Suffice it to say, in conclusion, that in the opinion of the writer, there is no immediate prospect of India's contributing to the world's sugar supply, if indeed she succeeds in producing enough for her own needs.

EDUCATION IN ENGLAND.

Sir Michael Sadler writes in *Indian Education* :—

One of the most interesting conferences at which education is discussed is that of the society for New Ideals in Education. This society is an influential body and will hold its next meeting at Cambridge at the end of the present month. It has taken as the subject of its conference, "The Creative Impulse and Its Place in Education." Lord Lytton will preside at the opening meeting, and the inaugural address is to be delivered by the President of the Arts and Crafts Exhibition Society. On the following day, under Lord Haldane's presidency, Dr. A. J. Brock will speak on "The Effect of Handicraft on Mind and Body," and Mr. William Rothenstein, the painter whose works have opened many Western eyes to the beauties of India, will speak on "Drawing and the Imaginative Side of Education." On the following day, the conference will discuss the position of the craftsman in relation to education and industry. Other topics which come under review are nationality in music; the educational value of the artistic crafts; needle craft and weaving and their place in education. At the closing meeting of the conference, Sir Frank Benson and Mr. John Drinkwater will speak on the training of the dramatic instinct.

This programme illustrates a new trend in educational thought in England. Those who sympathise with it believe that the work of pupils in schools and colleges should not be merely passive and assimilative. The power of self-expression through imaginative and original work should be stimulated and encouraged. Especially should this be done through the Practice of the arts. The reason for this is twofold. First, the love of beautiful things has great power over disposition and temperament. Secondly, the standard of excellence in every branch of creative art is so high as to inspire respect and admiration on the part of all who attempt to practise it. Art, using the word in its widest sense, has this double function in education. It trains the imaginative and creative powers; and it sets up an exacting standard of achievement. Under the inspiring leadership of a gifted teacher, the pupil becomes, as it were, an apprentice to the practice, of an art. His life is enriched by a new ideal of beauty. At the same time, he is brought face to face with an exacting standard of excellence, which forbids self satisfaction.

There is significance in the steady growth of this new movement in the educational thought of the

west. It is revolt against unnecessary ugliness in life and against the waste of beauty through indifference and heedless stupidity. It is an essential part of the new aspirations which are leavening the thoughts of labour. It is a protest against a one-sided insistence upon money value as the standard of what is pre-eminently useful and important. It is a sign of a change in human values, a preparation for the readjustment of mind and heart to a new way of life and to a new conception of the meaning of wealth. It is a presage of economic change. Educational thought and experiment give us clues to the future. They enable us to foresee what is coming. The outlook in Europe at the present time is revolutionary. No one can predict the course of the storm which is likely to break out against the existing economic order. But among the forces with which the West will have to reckon is an intense desire for greater freedom in the development of personality and for the fuller satisfaction of the instinct for beauty and self-realisation in the conduct of life. Those who wish to encourage the creative impulse in education are sensitive to this new movement in human thought and wish to guide it, by stimulus and by exacting discipline, to the choice of what is good and to the achievement of beauty in the lives of men and women and in the surroundings amid which they live.

As an example of what may be done in schools to combine exact training in language and literature with the practice of the arts, I will attempt to describe a remarkable performance by the children of the Hall School, Weybridge, on July 3 and 4. The Head Mistress, Miss Gilpin, with the assistance of expert helpers, had arranged for dramatic representation of a French story dating from the thirteenth century. It is called *Amis and Amiles*. It is the story of a great friendship. Two boys, Amis and Amiles, were taken, when children, to be baptised by the Pope in Rome. To each he gave a golden bowl, charging them to live with courage, courtesy and compassion and bidding them, if either should be in need, to seek the other's help. They were to be known to each other by the possession of the golden bowls. The boys were so much alike that they could not be known apart. This likeness made it possible for Amis to personate Amiles at a moment of great danger and to save his life. But Amis fell ill of leprosy. Borne upon a litter, he discovered himself to Amiles by the disclosure of the bowl. Amiles received Amis into his castle and tended him there. In the night, Amis saw a vision in which an angel told him that, for his cure, Amiles must kill his own two children and that this message must be given to Amiles by Amis himself. Amiles made the sacrifice. Amis was restored from his leprosy,

Amiles went to weep over his dead children, but found them singing and playing in bed. The two friends, who knew at what price the leprosy had been cured, rejoiced together over the happy ending. Such is the outline of the tale, which is found, under different names, in countries both East and West. Miss Gilpin had retained the old French, modernising the language when necessary, but adding nothing to it. Children, acting as a chorus, told in turn the narrative part of the story. The rest lent itself without change to dramatic representation.

Those whose good fortune it was to be present were moved by the beauty of what they saw and heard and by the significance of it. The enunciation and pronounciation of the children were perfect; the singing beautiful; the disposition of the stage and of the performers, exquisite. The children, under guidance, had made the banners and other properties which were used in the play. Dalcroze eurhythmics were used to represent troops of riders and the combatants at a tournament with an excited crowd. The music itself was drawn, as far as possible, from sources contemporary with the old French story. The colour and design of the scenes were adapted from illuminated missals of the thirteenth century. And yet, though accurate in point of scholarship, the play was full of the modern spirit. In preparing themselves for its performance, the children had expressed themselves. They had also undergone a severe discipline in learning the French, in mastering its meaning and pronounciation, in the study of the music, in the design and execution of the properties, and in perfecting themselves in the rhythmic movements required. The ages of the children ranged from 7 to about 14. Fifty took part in the play. The preparation of it had occupied most of their time for about two months.

The large company which witnessed the performance included many painters, musicians and education officials, as well as the parents and friends of the children. Those who were present realised that they were seeing one of the most beautiful things in the world.

Such work as this can only be done under conditions of educational freedom. The Hall School, Weybridge, is under inspection by the Board of Education. But, as it is a school for young children, its course of study and training can be adapted, according to the discretion of the Head Mistress to the needs of the children under her care. She brings to her work a genius for the devising of new methods of education. With the help of fellow-workers, she secures a very high level of excellence, both on the artistic and the more strictly educational side. The same educational spirit and the same

exacting standard in scholarship and design will be fruitful in other spheres of education, if opportunity is given. In the organization of the school system of the country, we should avoid anything which sets up a tyranny of examinations and shackles the freedom of teachers who are competent to use liberty to the advantage of their pupils.

SIGNS OF CHANGE IN GERMAN EDUCATION.

The influence, both direct and indirect, of German upon English educational ideas is so strong, partly because of the texture of European life, partly because of the skill with which the Germans have developed certain aspects of education, that changes which have taken place during the last two years in the educational outlook in Prussia indicate the force of some tendencies which are not unlikely to show themselves in English education policy. Mr. I. L. Kandel has written an interesting essay upon the new spirit in Prussian education during the last year of the war. The democratic movement has challenged the autocracy in regard to educational policy as in other fields of national endeavour. Since the overthrow of the monarchy, the Prussian Education Department has issued new rules for the governance of schools and universities. It is decreed that the teaching of history and other subjects must no longer be used to arouse national hatreds. All books which glorify war are to be removed from school libraries. Teachers are forbidden to make any remarks which would debase the achievements of the social revolution in Germany in the eyes of their pupils. They are enjoined to say nothing which might excite sympathy with a counter-revolution and endanger the democratic Government by the possibility of civil war. In other words, the schools are to become the allies of social democracy. In former days, the autocracy used the schools (so far as schools can be used) as barriers against the spread of social democratic opinion. Under the new condition, the schools are to be used in the defence of social democracy and as an escarpment against reaction.

Religion has ceased to be an examination subject. No teacher may in future be compelled to give religious instruction. Teachers who have been punished for their political or religious convictions are to be reinstated. A Socialist teacher has been appointed principal adviser to the Ministry of Education. Eminent representatives of scientific socialism are to be appointed to University Chairs.

The leaving examination from the higher secondary schools is to be transformed and the number of examinations reduced. Physical training is to be no longer of a military type. Larger powers of self-government have been given to teachers and pupils. Co-education has been introduced in some schools.

The way is being prepared for the introduction of unsectarian moral teaching. In other words, organized democracy is using bureaucratic control for the establishment of school system consonant with its principles and in harmony with its own spirit.

It is perhaps inevitable that one extreme policy should follow another by the swing of the political pendulum. For its over-organization in the interests of one party, Prussia seems likely now to pay the penalty of over-organization in an opposite direction. In the Prussian educational system foreshadowed by the new decrees, there is little hope for that variety of effort and liberty of self-expression which alone can reflect the different aspects of a many-sided national life and hold out hopes for a peaceful and stable development of national institutions.

LIBRARIES AND LIBRARIANS.

The "Daily Telegraph" writes:—

There can be no surer sign of a settled and developing civilisation than the foundation of libraries, nor is there any department of human interest in which the advance has been more scientific and thorough. We observe that the School of Librarianship recently instituted by the University of London at University College is shortly to begin its labours, after being formally opened by Sir Frederick Kenyon. A mere list of the appointments in the staff of the school shows how many different topics of the highest intellectual significance can be ranged under the general head of Librarianship. There is bibliography; the problem of cataloguing; classification and all that obscure subject involves; library organization, a vague term covering a great deal of methodical routine; literary history; selection of books; public library law; palæography and archives. A librarian nowadays is by no means an average individual known to be fond of books and therefore to be entrusted with their collection. He must know a great deal of science and a great deal of history; he must have studied ancient manuscripts; he must be well read in the classics and in modern languages, he must have a quick intuitive discernment as to the value of old documents, as well as a large acquaintance with works, both ancient and modern, belonging to pure literature. The first foundation of a library implies a civilisation that is conscious of itself, and therefore anxious to remember its own history. Naturally enough, the first use to which the invention of written symbols was applied was the regard of important religious and political transactions. These records, valuable to the State, would be preserved in sacred places, from which it would follow that the earliest libraries of the world were

probably, temples and the earliest librarians priests. In point of fact, priests were the only persons who could perform such work as the compilation of annals, and until the extension of the arts of writing and reading they alone possessed the necessary knowledge. Collections of archives were, undoubtedly, the first form of libraries. The Medes had collections of this kind at Ecbatana, the Persians also at Susa; and to these must be added the archives at Knossos discovered by Sir Arthur Evans of a date synchronising with the 12th Egyptian dynasty, more than two thousand years before the Christian era. Much later in point of time would come the collection of works of literature proper. Ballads, songs, and poems of every kind were conveyed orally from one generation to another long after the record of important events in which the State was concerned was regularly committed to writing.

Thus out of the mists of an almost legendary age comes down to us that unfailing instinct of culture which leads to the formation of a library. We have referred to the Medes and Persians, and to that wonderful Maritime Empire which had its home in Crete. But more important and more interesting is the case of Assyria. We owe to the persistent activity of Sir Henry Layard the discovery that in Nineveh there was an extensive library. In the course of his excavations more than half a century ago Layard came upon some closets or chambers in the place, the floor of which was covered a foot deep with tablets of clay. On these were written what are known as cuniform inscriptions, in many cases so small as to require a magnifying glass, the tablet varying in size from one inch to twelve inches square. There is no doubt what these were. They formed the library of the great Monarch whom the Greeks called Sardanapalus, and who is otherwise known as Assur-bani-pal. From this marvellous specimen of ancient culture it is but a step in the world's history to pass to the great libraries of Alexandria, which were the most important, as they were undoubtedly the most celebrated, in the ancient world. The story goes that Aristotle was one of earliest scholars in Greece to collect a library, and that it was he who communicated the taste for collecting to the Sovereigns of Egypt. At all events, under the enlightened rule of the Ptolemies a number of scholars and men of science were attracted to the capital, and found the materials for their industry in the libraries collected by such Monarchs as Ptolemy Soter and Ptolemy Philadelphus. Indeed, Ptolemy Euergetes, who succeeded Philadelphus had the rapacious habit of seizing all books brought into Egypt by foreigners for the benefit of his library, the owners being forced to be content with mere copies in exchange. It is somewhat doubtful how large the libraries—for there were two in Alexandria—were at the time of their greatest prosperity. According to tradition there were at least 400,000 and, perhaps, as many as 700,000 volumes. On the other hand, it must be remembered that the ancient book consisted of a roll containing a much smaller quantity of matter than a modern book. Herodotus's famous history, which we can easily get into two volumes, even with ample commentaries, originally consisted of nine "books" or, in other words, nine rolls. Homer's Iliad would extend to twenty four, so that, in comparison with modern libraries, the total number is not so great as at first sight it appears. But the libraries at Alexandria enjoyed no good fortune. When Cæsar set fire

to the fleet in the harbour of Alexandria the larger of the two libraries accidentally caught the flames and was destroyed. Antony, amongst other of his opulent gifts to Cleopatra, repaired the loss by presenting to his Queen the library from Pergamum, whose kings vied with the Egyptian rulers in their encouragement of literature. Henceforward the collection of volumes flourished until, according to the ordinary account, the conquest of Alexandria by the Saracens in 640 A. D. brought with it utter ruin. But it is unlikely that much remained for the Saracens to destroy, for there had been years of disorder and unsettlement, when literature and science had fallen into such neglect that it seems only too probable that a multitude of books would be sacrificed in the general anarchy.

We have lingered over ancient records because it is always interesting to trace the gradual rise and development of so great an industry as the collection of books. To give a library to a town was one of Carnegie's great ambitions, but his efforts were not always marked with the success that they deserved. In public libraries, however, this country is remarkably rich. The British Museum ranks in importance before all the great libraries of the world and perhaps excels them in the arrangement of its contents. Over five million items of various sorts, including not only printed volumes and MSS. but also pamphlets, are comprised in the collection. Especially valuable and important amongst many other possessions which make it famous is the department of MSS. in the British Museum. It ranges from the third century B.C. down to our own times. The old historical chronicles of England, the charters of Anglo-Saxon Kings, and the celebrated series of Arthurian romances are well represented here. So, too, owing to the famous collections made by Sir Robert Cotton and Robert Harley, Earl of Oxford, the Museum is the coveted possessor of Early Anglo-Saxon documents and Latin codices; while the Burney collection of classical MSS. has furnished important additions, the Museum being able to boast of an early copy of the Iliad and one of the earliest known codices of the Odyssey. But we have not the space to allude to all the treasures to be found in the celebrated edifice in Bloomsbury. Nor, indeed, can we do more than refer to the two other collections which can be compared with the British Museum, namely the Bodleian Library at Oxford and the University Library at Cambridge. Every pupil of the Alma mater is proud of the Bodleian Library, and is only sorry that more space cannot be found for storing in available fashion its priceless treasures. It is one thing, however, to possess these treasures, and it is quite another to make them generally useful. Here is where the science of librarianship comes in, especially in the formation of catalogues, which, unless they are arranged on thoroughly scientific lines, are apt to encumber and perplex the student by the very fulness of their references. It is relatively easy, of course, for so well-managed an institution as the London Library to make its books easily available, but when, instead of some 250,000 volumes—this is what the London Library possessed a few years ago—we have to deal with three or four millions,—the work of arranging and cataloguing becomes a stupendous task. It is for its zealous co-operation in discharging this and other duties that we wish all success to the School of Librarianship recently instituted by the University of London.

ECONOMIC NOTES.

INDUSTRIES AND COMMERCE.

The Ranade Industrial and Economic Institute.

We take the following from the Report of the Ranade Industrial and Economic Institute, Poona, for 1918-19 :—

After an experience extended over nearly six years of active work, it has now been decided by the Governing Board, that the Institute should undertake to work on problems regarding the development of Indian raw materials. In their resolution passed on the 7th of March 1918, the Governing Board say that "The primary purpose of the Techno-Chemical Laboratory of the Institute is the investigation of the development of Indian raw materials, the methods for whose utilization are not known or have not been worked out. When a proposed process has been worked out elsewhere, the applicant should be referred to the sources of information available. If there is any question, information on which is unavailable, in the attempt to establish the industry, the Laboratory of the Institute will be at the service of the applicant, as far as room is available and the Institute will be prepared even to engage special staff, for the purpose of investigation, provided the cost of such investigation and such staff be paid for by the applicant concerned."

In conformity with this resolution Mr. Limaye has been working during the period under report, on oils, especially the Neem Oil. About ten oil seeds which have not been sufficiently investigated, were collected, in the light of information available in published literature and it was decided to investigate thoroughly the oil from the seeds of *Melia Azadirachta*, Linn, since these were easily available in the neighbourhood.

Part of Mr. Limaye's time was taken up by the investigation of a low grade graphite from Central Provinces, in order to ascertain whether it could be purified so as to increase the percentage of graphite. He was able to push the percentage of graphite from about 13 to 36. As is well known such impure graphite cannot be used industrially unless the percentage in the final product is increased to at least 75.

Messrs. Kirloskar Bros. of Kirloskarwadi applied for some technical help regarding the distillation of wood. Mr. Limaye visited their factory and after inspecting the experimental plant erected there,

showed them how to separate the primary products of wood distillation.

During the period under report nearly forty different samples were received from the public and were reported upon to the satisfaction of the senders.

Mr. R. R. Deo, B. Sc., who was working on "Kumbha" fruit in the Laboratory for nearly a year as a chemist of the Ichalkaranji State left in July in order to specialize further in applied chemistry in the Indian Institute of Science, Bangalore.

JAPAN'S FOREIGN TRADE.

In a period of twenty-five years, during which she has fought three successful wars, Japan has increased her trade by more than 2,000 per cent says the *Board of Trade Journal*. The amount of bills which passed through the Clearing Houses throughout the country from February, 1918, to February, 1919, shows an increase of 432 per cent, i.e., yen 57,135,758,093, as compared with yen 10,725,252,142 in the same period of 1917-18.

The following are the comparative figures of Japan's foreign trade for the first six months of 1918 and 1919 :—

	Jan.-June.	
	(Value in yen approx.)	
	1918	1919
Total Exports	806,400,000	743,400,000
Total Imports	755,100,000	944,100,000

The monthly average value of merchandise exported (domestic produce) during the following years (values expressed in £ 1,000 sterling—currency converted at approximately par rates), has been :—

1913	... 5,355	1918	... 16,427
1914	... 4,992	1918 January	... 11,932
1915	... 5,954	February	... 12,690
1916	... 9,500	March	... 13,399
1917	... 13,479	April	... 14,373

Similarly, the monthly average of imports of merchandise for home consumption only has been :—

1913	... 6,173	1918	... 13,855
1914	... 5,021	1919—January	... 13,993
1915	... 4,435	February	... 17,229
1916	... 6,331	March	... 17,041
1917	... 8,604	April	... 21,019

In spite of the set-back due to the cessation of demand and hesitation and caution among buyers abroad owing to the fluctuation of prices, Japan's trade is in a fairly wholesome condition, though the end of the year is bound to see a steadily increasing adverse balance of trade. For example, Japan's exports to the United Kingdom in the first six months of 1919 are valued at 44,667,014 yen, against 69,537,212 for the last six months of 1918. On the other hand her imports from the United Kingdom were valued at 49,252,879 yen for January-June, 1919, against 32,756,387 for July-December, 1918. The demand at home, however, is on the increase, and there are encouraging prospects.

TRADE WITH CHINA. -

Ten years ago the total value of Japan's imports from and exports to China only exceeded Great Britain's total by taels 4,000,000. To-day, Japan's trade with China equals that of the whole British Empire, including Hongkong, and if her share in Hongkong's trade were correctly ascertained it would undoubtedly be found to exceed the British Empire's total by a very considerable amount. It is not considered, however, that Japan can maintain this predominance, which is largely due to the trade disabilities and restrictions imposed by the war on all European countries and the United States of America, of which she naturally took every advantage. Her trade with Hongkong showed a decline in the first half of this year.

	1916.	1917.	1918.
	Hk. Tls.	Hk. Tls.	Hk. Tls.
Exports to			
China ...	160,490,720	221,616,891	238,858,578
Imports from			
China ...	112,922,258	105,773,819	163,394,092

The Shantung Peninsula dispute between China and Japan has been having its effect in trading circles. A boycott against Japanese goods over the Shantung question has put new life into various markets, Chinese dealers having set aside, and in many cases destroyed, their Japanese stocks at great loss. Orders for lines previously obtained from Japan are being freely placed with other countries in spite of higher prices. The opinion is expressed that even on the settlement of the trouble a majority of the dealers will not return to Japanese goods. Some of the largest Chinese dealers and importers have resolved to set aside all the Japanese cargoes which they have held, and have given their customers assurances that Japanese goods will not be stocked in future. It must be noted, however, that in the period January-June last, Japanese exports to Kwantung nearly doubled to 63½ million yen, compared with the previous half-year.

TRADE WITH GERMANY.

In July a large number of Japanese industrials, merchants and journalists left for Germany. They had large orders to place from their principals. The object of their visit is to ascertain whether the German market is capable of absorbing Japanese wares, and whether an exchange of articles would be feasible, more particularly machinery. Japan wishes especially to capture the trade in Netherland, East Indies, Siam, China and the Straits, formerly in German hands, by means of German goods, which she intends taking in her own ships as return freight. But as, meanwhile, the Japanese banks are not prepared to extend credit, the matter must remain a question of barter only.

Japan also proposes that Germany should compete with Great Britain and America in supplying her machinery requirements. For example, in the Wuppertal Textile Machinery industry, all kinds of the most essential textile machines are constructed, not only power-driven iron weaving looms, but all the other large and small machines used in weaving, also the various machines necessary for dyeing, printing and finishing works. Japan is greatly in need of machines for cotton spinning and weaving. Hitherto Great Britain has supplied the Japanese market, but at present seems unable to meet the demand. America has made every attempt to secure the market, but prices prove a stumbling block. German exporters will compete for Japanese orders.

TRADE WITH BRITISH INDIA.

During the war Japan's trade with India showed very great development. In 1917-18, the total value was more than £ 30,000,000, an increase of 103 per cent in imports and 400 per cent in exports over the pre-war average.

The figures for the official year 1918-19, show that Japanese exports to India during that period reached a total of £ 22,333,333, which was practically equivalent to one-fifth of India's total import trade.

It is not so generally appreciated what an important part Japanese houses established in India play in the trade carried on between India and countries other than Japan. The census of 1911 showed that there were at that time only 32 male Japanese in India, excluding Burma. There are now large Japanese colonies in Calcutta and Bombay, which appear to be steadily growing in numbers and importance. There are now three Japanese exchange banks in India, whereas three years ago there was only one.

Ten years ago the greater part of the Japanese imports into India were carried in British ships,

financed by British banks, and distributed by British or Indian traders. Now, however, 90 per cent of these goods come in Japanese steamers. They are, to a large extent, consigned to Japanese firms, and the trade is mainly financed and distributed by Japanese nationals. Similar conditions obtained in the export trade. The Japanese Cotton Spinners Association practically dominates the market for raw cotton, and Japanese buyers are found in the cotton markets in the rural areas. In many cases they gin and bale their own purchases.

At present Japan's total trade with India exceeds that of all other countries except the United Kingdom, but there are strong probabilities that the figures for next years will show a substantial decline. From many quarters come reports of a growing dissatisfaction with Japanese goods on the part of the Indian consumer.

The increase in Indian trade with Persia between the years 1914 and 1918 (krans 149,000,000, or £6,500,000) consisted principally in cotton and woollen textiles, iron goods, rice, cereals, indigo, etc. It is, however, certain that though the goods were stated in the main to be of Anglo-Indian origin, they were in reality of Japanese origin, and passed through British India before being re-exported to Persia.

TRADE WITH NORTH AMERICA.

The needs of Japan of iron, chemicals and other goods have caused a great change in her commercial position with North America. Her exports in January-June, 1919, showed a shrinkage in value of yen 3,493,575, at yen 263,138,795, but her imports extended to yen 412,498,342, from yen 348,632,370 in the first six months of last year. The balance of trade in favour of the United States was yen 154,783,871 with Japanese imports from there increasing to yen 408,910,586. Trade with Canada fell off in both exports and imports to yen 7,482,962 against yen 11,021,506 and yen 2,686,795 against yen 3,566,339 in the respective half year.

TRADE WITH LATIN AMERICA.

A great increase has taken place during recent years, and especially since the outbreak of the war, in the trade of Japan and various South American States, and in nearly every case Germany has been the loser by it.

The upward tendency of Japanese trade with South American markets is well maintained up to the present so far as the export trade was concerned—her exports being valued at 11,430,152 yen for the January-June period against 8,664,782 yen for January-June, 1918, and 2,616,631 yen for the same period of 1917.

The general consensus of opinion in South America is that while Japanese factory prices are well below

those of the United States and Great Britain, freights are very high. Local importers state that the general tendency of Japanese exporters was at first to require payment in advance in yen. In some cases confirmed bank credits in port of shipment have been required. Credit policies appear, however, to have grown more liberal, and many firms are now dealing on a sight-draft basis. Recently a Japanese export house quoted goods to a local importer in dollars, payment to be made against delivery of documents. C.i.f. quotations are said to be common. The Argentine Republic is Japan's best customer, taking merchandise to the value of 6,107,025 yen in January-June this year, and 5,210,430 for the same period of 1918.

Abnormally high freight rates from the United States and Europe, as well as export restrictions in belligerent countries, have given the Japanese manufacturer an opportunity of which he has taken quick advantage. After a return to normal conditions distance will place him at a distinct disadvantage. That he intends, however, to remain in the market is apparent from the establishment of numerous branch houses, a bank, and a Chamber of Commerce at Buenos Aires.

Among the Japanese commodities which have found a market at Montevideo may be mentioned, in addition to the usual novelties, cotton piece-goods and drills, silks, shellac, rice, tea, tape, electrical supplies (particularly lamp cord), arsenic, and other drugs, heavy chemicals, medical compounds, druggists' supplies, steel rope, carbide, alarm clocks, toys, etc. Japanese steamers also bring sugar from Java, block tin from Singapore, tea and spices from Colombo, bagging from India, etc. A leading Montevideo importer recently received the visit of the Buenos Aires representative of a Japanese house and was offered a wide range of products, including, among others the following: Grated coconut, arsenic, stationery and office supplies, electrical materials, tooth brushes, chemicals, chlorate of potash, tea, etc.

One importer, who purchased Japanese specialities through German houses before the war, has during the past eight or ten months received without solicitation directly from Japan samples of muslins, poplins, cottons, towels, hosiery, underwear, silks, shoe leathers, electrical goods (chiefly lamp cord), pottery, toilet soaps, etc. The lines offered by Japanese merchants are constantly increasing in range and variety.

INDUSTRIAL ART AS A NATIONAL ASSET.

An American View.

Both in quantity and quality production, the value of a course of training in industrial art is destined to be an important factor in enhancing the value of finished goods. The subject is at present receiving special attention by a Department of the British Board of Trade in this country, and the Bureau of Education in the United States of America, say in a pamphlet recently issued that America must turn from her quantity methods, and, through industrial art training, put the country's commerce on a quality basis.

"There are not three standards of good taste," the pamphlet states "one for the producer, one for the storekeeper, and a third for the person who buys the goods. Yet these three groups have in modern times each misjudged the others, because education has yet to standardise and inter-relate their interests and tastes." In this concise statement, it is claimed, is indicated a basic problem confronting commerce to-day, and the pamphlet, which is summarised below, has been written to explain what training in industrial art can do to help to solve it.

WAGES AND EDUCATION.

While the activities of a nation depend upon its average ability, it is only through the training of the individual that the average can be changed. The comparison between the length of time the average hundred boys and girls remain in school and the incomes of the average American wage-earners offers valuable suggestions :—

Sixty-seven per cent leave school before completing the eighth grade.

Sixty-eight per cent of our citizens earn less than 15 dols. a week.

Thirty-three per cent of the students entering school complete the eighth grade.

Thirty-two per cent of the workers of the nation earn over 15 dols. a week.

From those thus remaining in school are recruited the more highly skilled workmen and practically the entire body of the professions, including the designers, upon whom the entire fabric of American manufactures depends. Higher standards of workmanship and higher wages depend upon the training

given in the industrial arts to those who form the mass of workmen, and upon whose skill depends the carrying out of the designer's ideas. Ninety per cent of the people gain no technical education higher than the eighth grade. This means that 90 per cent of the workers between the ages of 16 and 23 have no technical training except that which they have "picked up" themselves.

DESIGN AS A TRADE FACTOR.

The prosperity of the nation, the city, and village, as well as of the individual, depends upon the "turn-over" of their products as sold in the stores not only of our own country, but in those of the entire world.

Next to competition upon the ground of price, which is the chief factor in the sale of goods, without other merit the competition for goods made attractive through superior design and durability shows the wisdom and need for our cities to take definite steps toward the establishment of industrial art schools.

These schools will in time increase the quantity and value of the manufactures of their cities and of the nation—

- (1) By training the designers, workmen, and salesmen to sell superior products in the thousands of stores of their class.
- (2) By training the buyers and users to discriminate between the ugly and the bizarre and be able to choose and demand goods of merit.

Although education in art and industry can prepare us to make and choose wisely, whether we profit by this instruction individually or collectively depends upon our own initiative: (1) as consumers demanding design and durability in exchange for a reasonable price; (2) as designers, firm in the standards we set, being guided by the principles of evolution rather than by the idiosyncrasies of fashion; (3) as workmen, taking pride in excellence of craftsmanship and feeling a share of responsibility for the output; (4) as salesmen, guiding the buyer through an intelligent and thorough understanding of the romance of goods and a sympathetic insight into the needs of the purchaser, resulting in an enlightened customer and a satisfactory sale.

Except the agencies of education in industrial art bring these different groups of people to have the same standards, there will always be an unbridged gap between them—resulting in the customer's inability to get the goods he desires, the designer's failure to follow any standard but the "fashion," and the manufacturers' inability to sell on any basis other than price.

FROM BULK TRADE TO QUALITY SALES.

The commercial supremacy of the United States was largely reared upon the bulk disposal of raw or

semi-finished materials. American natural resources, while vast, are not unlimited. In fact, according to the National Conservation Commission, "the known supply of high-grade iron ore in the United States approximates 4,788,000,000 tons, which at the present increasing rate of consumption cannot be expected to last beyond the middle of the present century." This is an example of similar situations regarding other raw materials, particularly minerals.

We have been selling our resources on the bulk basis. It is said the United States sells 2,000 lb. of goods per 100 dols., England sells 1,000 lb. of goods per 100 dols., France sells 400 lb. per 100 dols., and Germany sold 30 lb. per 100 dols. Either we must turn from our quantity methods and, through industrial art training, put the nation's commerce on a quality basis, or we shall lose the opportunities and advantages which our fast-diminishing resources of raw materials offer.

There is no limit to the value that design and workmanship can add to the raw materials of the nation except that which is imposed by a lack of facilities for training the designers, workmen, salespeople, and consumers. The United States will not be able to increase the worth of its products toward the highest market values until it has more schools to train its people in the refinements of design and workmanship. The average extra dividend which skilled workmanship declares to a community is 59 per cent of the value of the finished product, the raw material being on an average worth 41 per cent of the selling price. Skill, therefore, adds to the wealth of a State on an average 144 per cent through a more efficient use of its raw materials.

EDUCATION.

Extension of Primary Education in Bengal.

In his opening speech before the Conference of Commissioners and Heads of Departments held at Darjeeling during the middle of this month Lord Ronaldshay referred to the question of Primary Education thus:

"There is one other item on your agenda paper which is of such immense importance that I cannot conclude these few remarks without making some reference to it. I refer to item number 18, which deals with the extension of primary education. In this connection you will have received the illuminating and suggestive note which has been drawn up by

Mr. Dunn. We all realise, I am sure, the importance of primary education and the need for its wider diffusion, but I am disposed to think that the extent of the progress which has been made in Bengal is not generally realised. The most recent statistics show that 1,200,000 boys, or approximately half the boys of primary school age, are already receiving some sort of primary education. The cost involved is approximately Rs. 4,000,000 a year, of which about one-half is derived from fees and the other from revenue, imperial, provincial and local. But the whole structure of primary education suffers from the lack of system. Of the 34,000 primary schools the greater number have sprung up spontaneously, like the wild flowers of the forest. What we have to do is to play the part of gardener, to take the forest in hand and convert it into a well-ordered garden. The subject falls naturally into two categories—the urban and the rural. Mr. Dunn lays stress upon the fact that in the municipalities, apart from Calcutta, there is even less trace of the system than in the rural areas, and he urges the necessity of a system of primary school control being created. I hope that the Primary Education Act which became law last spring will prove of substantial assistance to us in this direction. The preliminary steps which are authorised by that measure have been taken and we await with interest the replies of the different municipalities to the references which have been addressed to them. Turning to the districts, we find two methods of promoting primary education adopted by the District Boards. The more usual method is that of giving grants-in-aid to schools as they spring up, a method altogether lacking in system, in that it takes no account of the geographical distribution of the schools. The second method, which had its origin in Eastern Bengal, is far more scientific, and consists in building and maintaining a definite number of schools distributed on a given plan throughout panchayati unions. Considerable progress has been made with this scheme. Some 5,350 of the 7,580 of the panchayati unions are already in possession of satisfactory schools, but only about one quarter of the primary schools in rural areas have come into existence under this system, and the remaining three-quarters have sprung up on no organized plan at all. It seems quite clear, therefore, that one of the first things to be done is to introduce a system where blind chance at present reigns. Hardly less important than the introduction of a system into any scheme of expansion is the provision of trained teachers to staff the schools. This is a matter which has been occupying the attention of Government for some time past and, as you will see from Mr. Dunn's note, the scheme which we have submitted to the Secretary of State provides for an annual output of 3,200 Gurus when it is in full operation. Even under this scheme it will be some years before the existing schools, apart from new schools which will come into existence, will be adequately staffed with trained teachers, and it is a matter for consideration whether in the circumstances of the presidency the scheme can be expanded and speeded up.

CORRESPONDENCE.

To

The Editor,

Mysore Economic Journal, Bangalore.

Women's Education in Mysore.

Sir,—The whole problem of Education in Mysore is in the melting pot and Government are endeavouring to evolve with the public co-operation a definite educational policy. Every body seems to take much interest in the education of boys and various means are proposed to bring about a salutary system, while the equally important side of the problem, viz., the Education of Women, is relegated to a corner. Here and there we find an enthusiast, an ardent advocate of Women's Education. But even his warmth for the cause becomes cooled by the utter indifference of his seniors. That the problem requires immediate solution is undoubted. While additional facilities are ever and anon being created for the progress of the boys, women are—perhaps with a few exceptions—being driven down a retrogressive path. Home is not "sweet home" without the meeting of the parallel culture within its four walls. Imagine a house which the husband tries to keep tidy, while the wife besmears the ground with cowdung, firmly believing that such an operation is a purifying ceremony. The culture of both the sexes should proceed *pari passu* for the sake of domestic happiness, the healthy training of children and, in short, for the general welfare of the family.

Granting then, the necessity for the education of women, the question arises as to the medium of instruction. An eminent member of Government has very forcibly advocated the cause of vernacular being made the medium of instruction for women. Opinion is unanimous in the educated circle that the gates of Western knowledge can be tapped and women made "to drink deep" from the fountain of Western culture by means of imparting instruction through the language of the country. The pity of it is that, though people have this opinion in their heart of hearts, they are not bold enough to come forward, lest they might be tabooed as "old fashioned." But the day has come when we shall have to assume bold attitude towards every problem requiring solution, and we need not hesitate in giving frank expression to honest thought. Many of our educationists—both retired and still in harness—have not enlightened the public with their ideas, and this letter has been written with a hope that they will open the flood gates of their thought and set forth definite ideas about the vexed question of a medium of instruction for women.

The scheme proposed by the present Inspector-General of Education is sound to the very core. He has studied the problem from several standpoints and has come to the conclusion that vernacular should be the medium of instruction. There is perfect justification in his making a difference between the education of boys and girls. The one curriculum cannot be adopted *in toto* by the other. God, the Creator of both the sexes, distinctly meant that there should be a difference between them. While the male sex is better fitted to undergo the fatigue of labour in order to eke out a livelihood, the female sex is by nature intended for work of less strain. "Man to earn and woman to contribute to the domestic happiness" must be the motto for the solidarity of the dying Hindu Organization. The present materialistic world may adopt a different motto, viz., "Man to earn and women to earn, combine the income and live happy". I do not suppose for one moment that a woman bent upon earning an income will ever care to look to the duties of a housewife. She will cease to be a "Phantom of delight" and, ere long, she may take rank with the notorious Dame Van Winkle.

Then it may be asked, should not women earn an income? No man with common sense will say nay to this question. By all means let them earn, only by pursuits which are quite in consonance with their dignity as "Ministering Angels." In the present social organization, ordinarily there is no necessity for women to earn exclusively. They are but partners in the piloting of the domestic-ship and they are expected to lend a helping hand to the Captain and not conduct it as they please. However, unusual circumstances may occur when a woman has to earn a living—I mean the unfortunate class of widows that exist in the Country—when very sympathetic treatment is required. Bereft of the protector in early age and cast adrift on the broad world to die or to live, there is a likelihood of their deterioration, if not properly guided. To these, perhaps, the medium of instruction may be English as they need to imbibe Western culture to a very great extent and to vie with men in every walk of life. What is sauce for the widows cannot be sauce for the wives. Let the former, in their need for English Education, attend the schools and colleges meant for boys and compete with them in all the public examinations. Wives do not require the Hall Mark of any University. It is immaterial to them whether they master "Grimm's Law" or fail to understand the "Doctrine of the Encilisis." What they want is improvement in culture, which can be obtained by receiving instruction in vernacular. In this connection it must be admitted that the educated husbands have very great responsibilities on their shoulders. They having

access to Western culture must translate those ideas into vernacular for the betterment of their "better-halves." Text-books in vernacular required for a general proficiency course can be provided in a couple of years if they are not already in existence. The existing books should be made suitable for women and more should be written at once. A translation of Ganot's Physics is not necessary for women whose future lies in a cultured life in a happy home. A knowledge of Physics and Chemistry will go a long way to improve one's mind, but I do not know why research work, which can with advantage be left to men, should be undertaken by the "Hysterical women." Music, Painting and Cookery can be better taught in vernacular than in English. That the English notes jar on the Hindu ear is too well known and the playing of the Indian songs on the Harmonium cannot be described as very harmonious. The impression which prevails among women that men want to make a monopoly of culture is unfounded. Educated men would rejoice to have enlightened women their life partners. It is a fallacy to suppose that our salvation consists in nothing else except the wholesale importation of Western institutions. Our social and economic regeneration is quite unique. The West cannot wholly serve as a model for the East and the pitfalls into which the West has fallen in the past may be avoided. Thus, Western ideas can serve only as a guide and not as panacea.

The Reddy's School of opinion does not totally exclude English from the proposed curriculum. It may be studied either as a compulsory second language or as an optional subject. Vernacular is to be the medium of instruction to remove "the waste of energy and time, the encouragement of cramming and discouragement of all originality in thought." Government cannot legislate for a limited sect in a community. They must take the general state of affairs and in forming their schemes, allow exceptional circumstances, exceptional treatment. The argument that the reform of making vernacular the medium of instruction, should be first introduced into boys' schools and then into girls' schools, gives rise to an impression that men want to maintain the upper hand over women. It is far from the truth. The reform regarding the numerous boys who have advanced too far in English education cannot be brought into force by a *coup de etat*. It will take, perhaps, half a century to bring about that "consummation devoutly to be wished for." The number of women Graduates can be counted on one's fingers and the majority of girls have not got any kind of education. So, it is easier to start with vernacular as the medium of instruction.

77. Seshadripuram, }
Bangalore. }

T. RAJA RAU.

BOOKS IN BRIEF.

Principles and Methods of Taxation.—

By G. Armitage-Smith. Published by John Murray, London. 5sh. net.

Dr. Armitage-Smith's book needs no introduction at our hands. That a Seventh Edition of it has been called for shows its great popularity. Not only that it also testifies to the eminently practical manner in which a highly complex subject has been treated by Dr. Armitage-Smith. Its enunciation of the principles on which British taxation is based is both clear and concise. The present edition is enlarged and brought up-to-date with the addition of financial statements of war expenditure and the means of increasing the revenue during the war. In chapter two of the book the interested Indian student will find a brief but suggestive account of the Indian and French systems of revenue. We have scarcely any doubt that Dr. Armitage-Smith's book, in its present revised and enlarged form, will be widely appreciated by students and general readers.

War-Time Financial Problems.—By Hart-

ley Withers. Published by John Murray. Price 6sh. net.

It is impossible to speak too highly of any book from the pen of Mr. Hartley Withers. It is not infrequently an intellectual treat to read one of his volumes. The present one dealing with war-time financial problems is not only, as usual, a thoroughly readable but also economically sound. Mr. Withers writes in his inimitable way of Bank amalgamations, Currency questions, Company law reform, the Outlook for Capital, Treasury Control, the Capital Levy and many other allied subjects and offers suggestions which are not only original but also, we think, thoroughly feasible. Take, for instance, the taxation of capital. His criticism of the proposal is, we think, unanswerable on principle. His own contribution to the subject of debt redemption is a debt charge super-tax which he elaborates in specific terms at pp. 224—225 of his book. His chapter on "Meeting the Way Bill" deserves careful study, especially at the present moment when most seem to forget that production—increased and constant production—is the key to the situation.

Papers on Current Finance.—By H. S.

Foxwell, M. A. Published by Messrs. Macmillan and Co., London. Price 10sh. net.

This is mainly a reprint of papers and contributions made by Professor Foxwell of the London University to the *Economic Journal* and to other magazines and reviews. That Professor Foxwell's views expressed during the time the war lasted affected the policy of Government in regard to finance shows their

general soundness, both from the practical and from the theoretic points of view. Professor Foxwell advocated not only continuous borrowing but also heavy taxation. He also urged the interesting of the small investor. What Professor Foxwell says in regard to financing of industries ought to interest a wide circle of people in this country. His remarks on this topic are in fact of wider application. There are perhaps some who will not, however, wholly agree with him in his views on national finance *vs.* international finance and inflation. Professor Foxwell is a thorough going optimist—and his confession in this regard largely disarms criticism—and his opinions reflect his frame of mind. Incidentally we would note the praise—well deserved as we think—he bestows on the United States Federal Reserve Act. Those who realize what it has done for America during the war will know the utility of an organization of that kind specially during financial crises of the kind brought into existence by sudden outbreak of war, etc. Professor Foxwell in his introduction utters a word of protest against the secrecy that has prevailed in the British Statistical Department, during the war period. He says:—"This policy of secrecy and mystification is the most ugly feature of our war regime. It is to be hoped that it will end with the war. Publicity is the salt without which democracy (and we may add, bureaucracy) would soon become rotten; it is the indispensable condition of the healthy operation of public opinion."

The Indian Munitions Board have just issued a monograph entitled "The manufacture of Paint and Varnish in India" by Mr. N. Brodie, B.Sc., Chemist, Government Test House, Alipore. Copies may now be obtained from the Superintendent, Government Printing, India, 8, Hastings Street, Calcutta (Price four annas.) The following are the chief headings in the volume:—(1) Vehicle and varnish materials; (2) Pigments; (3) Manufacture of varnish; and (4) Manufacture of paint.

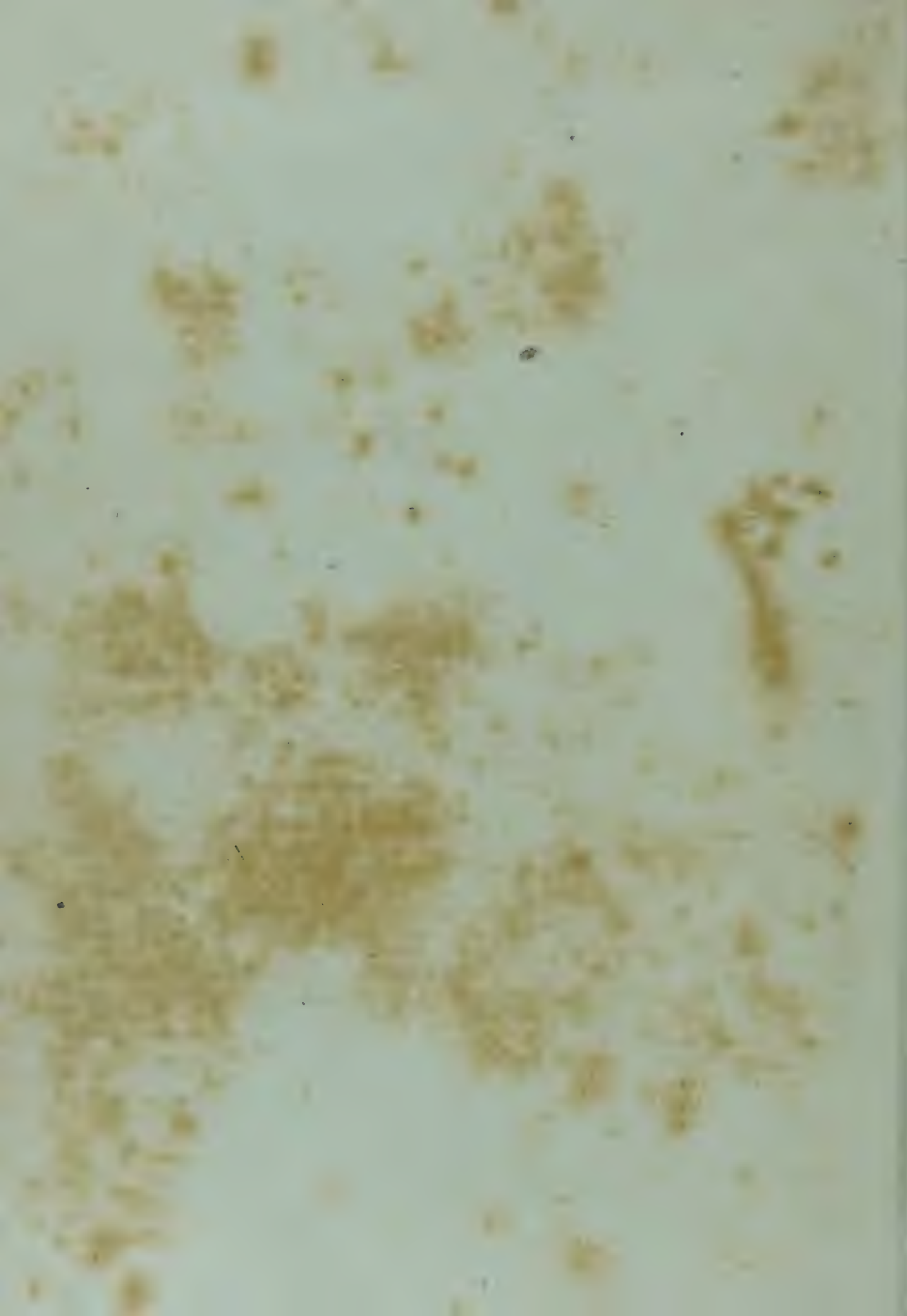
The Madras Government concur in the opinion of the Director of Public Instruction that the proposal to open a special secondary school for Panchamas is neither educationally sound nor at present practically feasible. They sanction the Director's proposal to institute sixteen scholarships and an equal number of fee-remissions for the benefit of Panchamas and other boys belonging to the aboriginal or criminal tribes studying in secondary schools. The value of these annual scholarships will be fixed at Rs. 3 per mensem when held in Forms I to III, and at Rs. 6 per mensem in Forms IV to VI. The scholarships may be held in conjunction with fee-remissions.

Glass manufacturers in Canada have been largely dependent in the past upon the United States for their supplies of glass sand and sodium carbonate. However, according to the United States Bureau of Mines Report, the new plant at Amherstburg, Ontario, Canada, at which sodium carbonate is to be made by the Solvay process, is expected to supply all of Canada's needs for soda ash. The capacity of this plant is reported to be about 120 tons per day. Some glass sand is being secured from Oneida, Ontario, but it is said to be of an inferior grade, and only suitable for the manufacture of the cheaper grades of glassware.

The power at present utilised at the Niagara Falls amounts, according to the *Engineer*, to 605,000 h.p., whilst schemes in process of development will absorb a further 420,000 h.p. It is estimated that a total of 2,500,000 h.p., equivalent to more than 16,000,000 tons of coal per annum, may be obtained without impairing the natural beauties of the Falls. The substances produced by the various electro-chemical companies cover a wide range, including abrasives, refractories, fertilisers, metals and alloys, inorganic compounds, and a variety of organic substances, such as chloroform, methyl, alcohol, and formaldehyde.

The *Technical Review* states that exhaustive experiments have been made on the utilization of Para rubber seeds for oil suitable for paints, varnishes, soaps, etc., and that the cake produced from the residue after the oil is extracted compares favourably with linseed and other oilcake as a food for stock. Rubber-seed oil has been sold at 250 dollars a ton at a time when linseed oil cost 300 dollars. In British Malaya alone no less than 633,000 acres were actually producing rubber last year, and the seeds, estimated at 300 lb. to the acre, are at present allowed to fall to the ground and rot.

In Cuba plans have been formulated for the establishment of an "Association de Hacendados y Colonos," the work of which will be divided into nine departments, *viz.*, agriculture and industry, immigration, transportation, statistics, national and import taxes, arbitration, banking and warehousing, moral and material interests, and legal. Among the objects of the association are the passing of beneficial laws, the lowering of the cost of machinery, implements, and other supplies, freights and taxes, loaning money to manufacturers and cane-growers until their produce is sold, intervening in disputes between growers and manufacturers, fixing the cost of labour, etc. It is emphasised that Cuba, as the greatest sugar-producing country, should have the deciding voice in the control of the world's sugar market.



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